K.L.N. COLLEGE OF ENGINEERING

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

(Approved by AICTE, New Delhi, permanently affiliated to Anna University, Chennai)

(Accredited by NBA, New Delhi)

B.E. – EEE – IV – Semester - Students Hand book – Even Semester of 2016 – 2017

This book contains the following:

1. Vision and Mission of the College and Department, Program Educational Objectives, Program Specific Outcomes, Program Outcomes.
2. Outcome Based Education, Benefits and Significance of accreditation.
3. Engineering Ethics.
4. Blooms Taxonomy.
5. Academic Calendar – 2016 – 2017 (Even semester).
6. Class Time Table.
7. B.E. – EEE – Syllabus – IV Semester.
8. Lecture Schedule, Tutorial, Assignment questions.
9. Anna University question papers (Previous years).
10. Anna University - Malpractices and Punishment in University Examinations
11. OD Norms
12. About the College and Department
13. Faculty List, Mobile number, Mail ID
14. Placement Mock test paper.
15. TANCET - Questions & Answers.
16. General tips for effective communication and Leadership skills.

K.L.N. COLLEGE OF ENGINEERING

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

VISION AND MISSION OF THE COLLEGE

VISION:

To become a Premier Institute of National Repute by Providing Quality Education, Successful Graduation, Potential Employability and Advanced Research & Development through Academic Excellence.

MISSION:

To Develop and Make Students Competent Professional in the Dynamic Environment in the field of Engineering, Technology and Management by emphasizing Research, Social Concern and Ethical Values through Quality Education System.

VISION AND MISSION OF THE DEPARTMENT

VISION:

To become a high standard of excellence in Education, Training and Research in the field of Electrical & Electronics Engineering and allied applications.

MISSION:

To produce excellent, innovative and Nationalistic Engineers with Ethical Values and to advance in the field of Electrical & Electronics Engineering and allied areas.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The Educational Objectives of the Electrical and Electronics Engineering (EEE) Programme represent major accomplishments that we expect our graduates to achieve after three to five years of graduation. More specifically our graduates are expected:

PEO1: to excel in industrial or graduate work in Electrical and Electronics Engineering and allied fields

PEO2: to practice their Professions conforming to Ethical Values and Environmentally friendly policies

PEO3: to work in international and multi-disciplinary Environments

PEO4: to successfully adapt to evolving Technologies and stay current with their Professions

PROGRAM SPECIFIC OUTCOMES (PSOs)

Electrical and Electronics Engineering Graduates will be able to:

PSO1:

Apply the fundamentals of mathematics, science and engineering knowledge to identify, formulate, design and investigate complex engineering problems of electric circuits, analog and digital electronic circuits, electrical machines and power systems.

PSO2:

Apply appropriate techniques and modern Engineering hardware and software tools in power systems to engage in life- long learning and to successfully adapt in multi disciplinary environments.

PSO3:

Understand the impact of Professional Engineering solutions in societal and environmental context, commit to professional ethics and communicate effectively.

PROGRAM OUTCOMES (POs)

Electrical and Electronics Engineering Graduates will be able to:

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development. **PO8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

OUTCOME BASED EDUCATION (OBE)

In a traditional education system, students are given grades and rankings compared to each other. Content and performance expectations are based primarily on what was taught in the past to students of a given age. The goal of traditional education was to present the knowledge and skills of an older generation to the new generation of students, and to provide students with an environment in which to learn. The process paid little attention (beyond the classroom teacher) to whether or not students learn any of the material.

An outcome is a culminating demonstration of learning; it is what the student should be able to do, at the end of a course/program, in-terms of the knowledge, skill and behavior.

Outcome-based education is an approach to education in which decisions about the curriculum are driven by the exit learning outcomes that the students should display at the end of the course. In outcome-based education, product defines process. Outcome-based education can be summed up as results-oriented thinking and is the opposite of input-based education where the emphasis is on the educational process. Outcome-based education promotes fitness for practice and education for capability.

BENEFITS AND SIGNIFICANCE OF ACCREDITATION

The process of accreditation helps in realizing a number of benefits, such as:

- Helps the Institution to know its strengths, weaknesses and opportunities
- Initiates Institutions into innovative and modern methods of pedagogy
- Gives Institutions a new sense of direction and identity
- Provides society with reliable information on quality of education offered
- Promotes intra and inter-Institutional interactions

Accreditation signifies different things to different stakeholders. These are:

Benefits to Institutions

Accreditation is market-driven and has an international focus. It assesses the characteristics of an Institution and its programmes against a set of criteria established by National Board of Accreditation. NBA's key objective is to contribute to the significant improvement of the Institutions involved in the accreditation process. Accreditation process quantifies the strengths, weaknesses in the processes adopted by the Institution and provides directions and opportunities for future growth. NBA provides a quality seal or label that differentiates the Institutions from its peers at the national level. This leads to a widespread recognition and greater appreciation of the brand name of Institutions and motivates the Institutions to strive for more.

Benefits to Students

Students studying in NBA accredited Institutions can be assured that they will receive education which is a balance between high academic quality and professional relevance and that the needs of the corporate world are well integrated into programmes, activities and processes. It signifies that he has entered the portals of an Institution, which has the essential and desirable features of quality professional education.

Benefits to Employers

Accreditation assures prospective employers that students come from a programme where the content and quality have been evaluated, satisfying established standards. It also signifies that the students passing out have acquired competence based on well-established technical inputs.

Benefits to the Public

Accredited status represents the commitment of the programme and the Institution to quality and continuous improvement.

Catalyst for International Accreditations

Due to accreditation from NBA, the Institution's systems and procedures get aligned with the Institution's Mission and Vision. All essential prerequisites for international accreditation are included in the accreditation process of NBA. Therefore, NBA acts as a catalyst for the Institutions planning to acquire International Accreditation.

Benefits to Industry and Infrastructure Providers

It signifies identification of quality of Institutional capabilities, skills and knowledge.

Benefits to Parents

It signifies that their ward goes through a teaching-learning environment as per accepted good practices.

Benefits to Alumni

It reassures alumni that alumni are products of an institute with a higher standing in terms of learning.

Benefits to Country

Accreditation helps in gaining confidence of stakeholders and in giving a strong message that as a country, our technical manpower is of international standards and can be very useful in enhancing the global mobility for our technical manpower.

ENGINEERING ETHICS

Engineering Ethics is the set of rules and guidelines that engineers adhere to as a moral obligation to their profession and to the world. Engineering is a professional career that impact lives. When ethics is not followed, disaster often occurs; these disasters not only include huge monetary costs and environmental impacts, but also often result in the loss of human life. Engineering Ethics applies to every engineer and is very important.

The National Society of Professional Engineers (NSPE) decides the overall standards and codes of ethics for all the engineering professions. The Preamble of the NSPE *Code of Conduct for Engineers* (2007) states: "*Engineers shall at all times recognize that their primary obligation is to protect the safety, health, property, andwelfare of the public. If their professional judgment is overruled under circumstances where the safety, health, property, or welfare of the public are endangered, they shall notify their employer or client and such other authority as may be appropriate.*"

Electrical Engineering Ethics

Electrical Engineering is a type of engineering profession that deals with the creation of better electronics. Since our society is heading towards an era of technology, where all members of society will be affected, it is especially important for electrical engineers to follow a code of engineering ethics. For electrical engineers, an important set of guidelines is the *Electrical Engineering Code of Ethics*, published by IEEE.

IEEE code of Ethics

We, the members of the IEEE, in recognition of the importance of our technologies in affecting the quality of life throughout the world, and in accepting a personal obligation to our profession, its members and the communities we serve, do hereby commit ourselves to the highest ethical and professional conduct and agree:

1. to accept responsibility in making decisions consistent with the safety, health, and welfare of the public, and to disclose promptly factors that might endanger the public or the environment;

2. to avoid real or perceived conflicts of interest whenever possible, and to disclose them to affected parties when they do exist;

3. to be honest and realistic in stating claims or estimates based on available data;
4. to reject bribery in all its forms;
5. to improve the understanding of technology; its appropriate application, and potential consequences;
6. to maintain and improve our technical competence and to undertake technological tasks for others only if qualified by training or experience, or after full disclosure of pertinent limitations;
7. to seek, accept, and offer honest criticism of technical work, to acknowledge and correct errors, and to credit properly the contributions of others;
8. to treat fairly all persons and to not engage in acts of discrimination based on race, religion, gender, disability, age, national origin, sexual orientation, gender identity, or gender expression;
9. to avoid injuring others, their property, reputation, or employment by false or malicious action;
10. to assist colleagues and co-workers in their professional development and to support them in following this code of ethics.

Engineering Ethics in College/Education

The main engineering ethics problem that college students are face with is academic integrity. Academic integrity can show itself in the form of cheating by copying someone's work, intentional cheating, plagiarism, and/or self-plagiarism.

However, professional ethics is something that can be learned even when it conflicts with personal ethics, as for example, a situation where you are personally okay with building a product that can harm the environment, yet save lives. You can learn professional ethics and realize that something that is harmful to the environment is not okay. Ethics codes can even help you see the bigger picture. For example, in the previous scenario, these codes can help you re-evaluate your ethics and realize that something that is harmful to the environment will eventually be harmful to the people around you and yourself.

Engineering Ethics in the Professional World

In the professional world, ethical engineering problems come up in many cases. One of these includes the case of a professional using someone else's work that is published in the widespread market of publication. Another is the case of a professional using someone else's work that is not published yet and stealing their idea. Engineers who have good engineering ethics often have a good sense of the value of life. They don't hesitate to admit that they made a mistake because they know that the cost of not owning up to your mistakes can have disastrous consequences. It might even cost a human life.

Engineering Ethics in Companies

Not only do individual engineers have to be conscious of engineering ethics, but also companies. Companies have to be aware of their Corporate Social Responsibility and Environmental Responsibility. Corporate Social Responsibility is a company's responsibility to give back to the community that they profit from and to behave ethically so that both they and their community can benefit. Environmental Responsibility is a business's initiative to leave the environment (where it is taking its resources from) the same, if not better, that it is found it.

BLOOM'S TAXONOMY

Definitions of the different levels of thinking skills in Bloom's taxonomy

1. **Remember** –recalling relevant terminology, specific facts, or different procedures related to information and/or course topics. At this level, a student can remember something, but may not really understand it.

2. **Understand** –the ability to grasp the meaning of information (facts, definitions, concepts, etc.) that has been presented.

3. **Apply** –being able to use previously learned information in different situations or in problem solving.

4. **Analyze** –the ability to break information down into its component parts. Analysis also refers to the process of examining information in order to make conclusions regarding cause and effect, interpreting motives, making inferences, or finding evidence to support statements/arguments.

5. **Evaluate** –being able to judge the value of information and/or sources of information based on personal values or opinions.

6. **Create** –the ability to creatively or uniquely apply prior knowledge and/or skills to produce new and original thoughts, ideas, processes, etc. At this level, students are involved in creating their own thoughts ideas.

List of Action Words Related to Critical Thinking Skills

REMEMBER	UNDERSTAND	APPLY	ANALYZE	EVALUATE	CREATE
Count	Associate	Add	Analyze	Appraise	Categorize
Define	Compute	Apply	Arrange	Assess	Combine
Describe	Convert	Calculate	Breakdown	Compare	Compile
Draw	Defend	Change	Combine	Conclude	Compose
Identify	Discuss	Classify	Design	Contrast	Create
Label	Distinguish	Complete	Detect	Criticize	Drive
List	Estimate	Compute	Develop	Critique	Design
Match	Explain	Demonstrate	Diagram	Determine	Devise
Name	Extend	Discover	Differentiate	Grade	Explain
Outline	Extrapolate	Divide	Discriminate	Interpret	Generate
Point	Generalize	Examine	Illustrate	Judge	Group
Quote	Give	Graph	Infer	Justify	Integrate
Read	examples	Interpolate	Outline	Measure	Modify
Recall	Infer	Manipulate	Point out	Rank	Order
Recite	Paraphrase	Modify	Relate	Rate	Organize
Recognize	Predict	Operate	Select	Support	Plan
Record	Rewrite	Prepare	Separate	Test	Prescribe
Repeat	Summarize	Produce	Subdivide		Propose
Reproduce		Show	Utilize		Rearrange
Select		Solve			Reconstruct
State Write		Subtract			Related
		Translate			Reorganize
		Use			Revise
					Rewrite
					Summarize
					Transform
					Specify

Date: 21.12.2016

ANNA UNIVERSITY: : CHENNAI – 600 025

ACADEMIC SCHEDULE

for the

January 2017 – May 2017 (EVEN SEMESTER) SESSION OF THE

ACADEMIC YEAR 2016 – 2017

UG & PG Degree Programmes offered in **Affiliated Engineering Colleges**

Sl. No.	Programme	Semester	Commencement of Classes	Last working day	Commencement of End Semester Examinations
1.	**B.E. / B.Tech.(Full-Time)**	**VIII**	**04.01.2017**	**13.04.2017***	**17.04.2017**
2.	B.E. / B.Tech.(Full-Time)	II,IV,VI	**04.01.2017**	**24.04.2017**	**27.04.2017**
3.	B.E. (Part-Time)	III,V,VII			
4.	B.Arch. (Full-Time)	II,IV,VI,VIII,X			
5.	M.E. / M.Tech./ M.Arch.(FT)	II,IV	**23.01.2017**	**05.05.2017****	**10.05.2017**
6.	M.C.A. (Full-Time)	II,IV,VI			
7.	M.B.A. (FT)	II,IV			
8.	M.Sc (5 Yrs-Integrated)	II,IV,VI,VIII,X			
9.	M.Sc.(2 Yrs)	II,IV			
10.	M.B.A. (5 Yrs-Integrated)	II			

RE - OPENING DAY FOR THE NEXT SEMESTER: 03.07.2017 (Monday)

***6 Saturdays are Working days**
****4 Saturdays are Working days**

NOTE:

1. The Theory and Practical Examination schedules will be published in the due course (Practical Examinations will be conducted before the theory examinations).
2. If necessary, loss of classes due to various curricular / co-curricular activities of the department / college may be compensated by conducting classes on Saturdays.

DIRECTOR
ACADEMIC COURSES

DAC - SB

K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM POST - 630 612
ACADEMIC CALENDAR - Even Semester of 2016-2017 – Summary (Proposed)
IV, VI & VIII SEMESTER UG & II, IV&VI SEMESTER PG DEGREE COURSES

S.No.	Date (Day)	Programme / Events	*Day*
		DECEMBER 2016	
1	28.12.2016 (Wednesday)	Re-opening Day- B.E / B.Tech-IV&VI Semester	*01*
		JANUARY 2017	
2	01.01.2017(Sunday)	NEW YEAR – HOLIDAY- FOUNDERS DAY	-
	02.01.2017(Monday)	Re-opening day- II &VIII -B.E./B. Tech (except ECE AUE- VIII sem)	05
3	03.01.2017(Tuesday)	Re-opening day - VIII -B.E./B. Tech - ECE &AUE	06
4	14.01.2017 (Saturday)	PONGAL - HOLIDAY	-
5	15.01.2017(Sunday)	THIRUVALLUVAR THINAM- HOLIDAY	-
6	16.01.2017(Monday)	ULAVAR THIRUNAAL - HOLIDAY	-
7	19.01.2017 (Thursday)	CIT –I (IV, VI & VIII semester B.E/ B.Tech)	17
8	23.01.2017(Monday)	Commencement of classes – II, IV & VI semester PG courses	19
9	26.01.2017(Thursday)	REPUBLIC DAY - HOLIDAY	-
		FEBRUARY 2017	
10	08.02.2017(Wednesday)	CIT –II (IV, VI & VIII semester B.E/ B.Tech)	31
11	25.02.2017(Saturday)	Parents –Teachers Meeting	45
12	27.02.2017(Monday)	CIT –III (IV, VI & VIII semester B.E/ B.Tech)	46
		MARCH 2017	
13	03.03.2017(Friday)	Annual Sports day	50
14	07.03.2017 (Tuesday)	Technical Symposium – Mechanical - Tentative	52
15	09.03.2017(Thursday)	Technical Symposium – EEE - Tentative	54
16	11.03.2017 (Saturday)	19th Graduation day- Tentative	56
17	14.03.2017 (Tuesday)	Technical Symposium –ECE - Tentative	58
18	16.03.2017(Thursday)	CIT –IV (IV, VI & VIII semester B.E/ B.Tech)	60
19	17.03.2017(Friday)	Technical Symposium –MBA - Tentative	61
20	25.03.2017(Friday)	Technical Symposium –CSE - Tentative	67
21	28.03.2017(Tuesday)	Technical Symposium –IT - Tentative	69
22	29.03.2017(Wednesday)	TELUGU NEW YEAR - HOLIDAY	-
23	30.03.2017(Thursday)	Technical Symposium –AUE - Tentative	70
24	31.03.2017(Friday)	Technical Symposium –EIE- Tentative	71
		APRIL 2017	
25	03.04.2017(Monday)	CIT –V (VIII semester B.E/ B.Tech)	72
26	05.04.2017(Wednesday)	AU Practical – Slot –I (VIII semester B.E / B.Tech) - Tentative	74
27	07.04.2017(Friday)	CIT –V (IV, VI semester B.E/ B.Tech)	76
28	08.04.2017(Saturday)	23rd College Annual Day – Tentative	77
29	09.04.2017(Sunday)	MAHAVIR JEYANTHI - HOLIDAY	-
30	10.04.2017(Monday)	AU Practical – Slot –I (II, IV, VI semester B.E / B.Tech)– Tentative AU Practical – Slot –II (VIII semester B.E / B.Tech) - Tentative	78
31	13.04.2017(Thursday)	Last working Day- VIII- Semester – B.E / B.Tech	81
32	14.04.2017(Friday)	TAMIL NEW YEAR / GOOD FRIDAY/ Dr. AMBEDKAR'S BIRTHDAY - HOLIDY	-
33	17.04.2017(Monday)	AU Practical – Slot –II(II, IV, VI semester B.E / B.Tech) - Tentative Commencement of Anna University – Theory Examinations- VIII semester –B.E / B.Tech	82
34	24.04.2017(Monday)	Last working Day- II, IV & VI- Semester – B.E / B.Tech	88
35	27.04.2017(Thursday)	Commencement of Anna University – Theory Examinations- II, IV & VI semester –B.E / B.Tech	91
		MAY 2017	
36	01.05.2017(Monday)	MAY DAY – HOLIDAY	-
37	05.05.2017(Friday)	Last Working day (II, IV & VI semester PG courses)	96
38	10.05.2017(Wednesday)	Commencement of Anna University – Theory Examinations – PG courses	-

Re-opening Day: III, V, VII Semester – B.E./B.Tech., : 26th June 2017(Monday)

Re-opening Day: III, V Semester – M.E ., M.B.A & M.C.A : 3rd July 2017(Monday)

K.L.N.COLLEGE OF ENGINEERING, POTTAPALAYAM-630612.
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
CLASS WISE TIME TABLE -2016-2017 (EVEN)

Year/Sem/Sec : II / IV / A **Faculty In-charge :P.Loganthurai**

TIME→ DAY↓	09.00 – 09.50	09.50 – 10.40	10.55- 11.45	11.45- 12.35		01.15- 02.05	02.05- 02.55	02.55- 03.45	04.00- 05.00
PERIOD→	I	II	III	IV		V	VI	VII	VIII
MON	DTSSP SR	M&I MJM	EM-I PLT	NM PD	L U N C H	EM LAB -I PLT, MBL. SPRR			-
TUE	EM-I PLT	DTSSP SR	M&I MJM	OOP MSCS		T&D ASSM	NM PD	TPO	T&D ASSM
WED	NM PD	OOP MSCS	EM-I PLT	M&I MJM		OOP/M&I MSCS, MJM	OOP LAB MSCS, JM, AMJ		
THU	OOP MSCS	T&D ASSM	T&D ASSM	DTSSP SR		NM PD	EM-I(T) PLT,SPRR	DTSSP SR	DTSSP SR
FRI	T&D ASSM	NM PD	OOP MSCS	DTSSP SR		T&D ASSM	M&I MJM	EM-I PLT	-

Year/Sem/Sec : II / IV / B **Faculty In-charge :A. Manoj**

TIME→ DAY↓	09.00 – 09.50	09.50 – 10.40	10.55- 11.45	11.45- 12.35		01.15- 02.05	02.05- 02.55	02.55- 03.45	04.00- 05.00
PERIOD→	I	II	III	IV		V	VI	VII	VIII
MON	EM-I PLT	DTSSP MGK	T&D MBL	OOP AMJ	L U N C H	M&I CVR	NM MD	M&I CVR	-
TUE	NM MD	OOP AMJ	T&D MBL	EM-I(T) PLT,SPRR		EM-I PLT	EM LAB -I MBL, PLT, SPRR		
WED	DTSSP MGK	T&D MBL	OOP AMJ	DTSSP MGK		NM MD	TPO	EM-I PLT	M&I CVR
THU	T&D MBL	M&I CVR	NM MD	EM-I PLT		T&D/DTSSP MBL, MGK	OOP LAB AMJ, MSCS, JM		
FRI	M&I CVR	EM-I PLT	DTSSP MGK	NM MD		DTSSP MGK	T&D MBL	OOP AMJ	-

Year/Sem/Sec : II / IV / C **Faculty In-charge : J. Merlin**

TIME→ DAY↓	09.00 – 09.50	09.50 – 10.40	10.55- 11.45	11.45- 12.35		01.15- 02.05	02.05- 02.55	02.55- 03.45	04.00- 05.00
PERIOD→	I	II	III	IV		V	VI	VII	VIII
MON	NM PV	OOP JM	DTSSP RD	M&I KRJ	L U N C H	OOP LAB JM, MSCS, AMJ			-
TUE	EM-I SPRR	T&D APSR	NM PV	OOP JM		T&D APSR	DTSSP RD	TPO	OOP JM
WED	M&I KRJ	NM PV	DTSSP RD	EM-I SPRR		M&I KRJ	EM LAB -I SPRR, MBL, KRJ		
THU	OOP JM	EM-I(T) SPRR,PLT	T&D APSR	T&D APSR		NM PV	M&I KRJ	DTSSP RD	EM-I SPRR
FRI	DTSSP RD	M&I KRJ	EM-I SPRR	T&D APSR		OOP JM	NM PV	EM-I SPRR	

SUB CODE	SUBJECT NAME		STAFF NAME		
			Section - A	Section - B	Section - C
MA6459	Numerical Methods (T)	NM	P.Dhanapriya	Dr. M.Devaraj	V.Viayalakshmi
EE6401	Electrical Machines – I (T)	EM-I	P.Loganthurai	P.Loganthurai	S.P.Rajaram
CS6456	Object Oriented Programming	OOP	M.S.C.Sujitha	A.Manoj	J.Merlin
EE6402	Transmission and Distribution	T&D	Dr.A.S.S.Murugan	M.Bharanilakshmi	A.P.S.Ramalakshmi
EE6403	Discrete Time Systems and Signal Processing	DTSSP	S.Rajalingam	M.Ganeshkumari	R.Divya
EE6404	Measurements and Instrumentation	M&I	M.Jeyamurugan	Dr.C.Vimalarani	K.R.Jeyavelumani
CS6461	Object Oriented Programming Laboratory	OOP LAB	M.S.C.Sujitha	A.Manoj	J.Merlin
EE6411	Electrical Machines Laboratory - I	EM LAB-I	P.Loganthurai	M.Bharanilakshmi	S.P.Rajaram

MA6459 **NUMERICAL METHODS** **L T P C**
3 1 0 4

OBJECTIVES:

This course aims at providing the necessary basic concepts of a few numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 10+3

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method- Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Matrix Inversion by Gauss Jordan method - Eigen values of a matrix by Power method.

UNIT II INTERPOLATION AND APPROXIMATION 8+3

Interpolation with unequal intervals - Lagrange's interpolation – **Newton's divided difference** interpolation – Cubic Splines - Interpolation with equal intervals - **Newton's forward and backward** difference formulae.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 9+3

Approximation of derivatives using interpolation polynomials - Numerical integration using **Trapezoidal, Simpson's 1/3 rule – Romberg's method** - Two point and three point Gaussianquadrature formulae – Evaluation of double integrals by Trapezoidal and Simps**on's 1/3 rules.**

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9+3

Single Step methods - **Taylor's series method** - **Euler's method** - **Modified Euler's method** - Fourth order Runge-Kutta method for solving first order equations - Multi step methods - **Milne's and** Adams-Bash forth predictor corrector methods for solving first order equations.

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 9+3

Finite difference methods for solving two-point linear boundary value problems - Finite difference **techniques for the solution of two dimensional Laplace's and Poisson's equat**ions on rectangular domain– One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods – One dimensional wave equation by explicit method.

TOTAL (L:45+T:15): 60 PERIODS

OUTCOMES:

The students will have a clear perception of the power of numerical techniques, ideas and would be able to demonstrate the applications of these techniques to problems drawn from industry, management and other engineering fields.

TEXT BOOKS:

1. Grewal. B.S., and Grewal. J.S.,"Numerical methods in Engineering and Science", Khanna Publishers, 9th Edition, New Delhi, 2007.
2. Gerald. C. F., and Wheatley. P. O., "Applied Numerical Analysis", Pearson Education, Asia, 6th Edition, New Delhi, 2006.

REFERENCES:

1. Chapra. S.C., and Canale.R.P., "Numerical Methods for Engineers, Tata McGraw Hill, 5th Edition, New Delhi, 2007.
2. Brian Bradie. "A friendly introduction to Numerical analysis", Pearson Education, Asia, New Delhi, 2007.
3. SankaraRao. K., "Numerical methods for Scientists and Engineers", Prentice Hall of India Private, 3rd Edition, New Delhi, 2007

EE6401 ELECTRICAL MACHINES – I L T P C
3 1 0 4

OBJECTIVES:

- To introduce techniques of magnetic-circuit analysis and introduce magnetic materials
- To familiarize the constructional details, the principle of operation, prediction of performance, the methods of testing the transformers and three phase transformer connections.
- To study the working principles of electrical machines using the concepts of electromechanical energy conversion principles and derive expressions for generated voltage and torque developed in all Electrical Machines.
- To study the working principles of DC machines as Generator types, determination of their no-load/load characteristics, starting and methods of speed control of motors.
- To estimate the various losses taking place in D.C. Motor and to study the different testing methods to arrive at their performance.

UNIT I MAGNETIC CIRCUITS AND MAGNETIC MATERIALS 9

Magnetic circuits –Laws governing magnetic circuits - Flux linkage, Inductance and energy – Statically and Dynamically induced EMF - Torque – Properties of magnetic materials, Hysterisis and Eddy Current losses - AC excitation, introduction to permanent magnets- Transformer as a magnetically coupled circuit.

UNIT II TRANSFORMERS 9

Construction – principle of operation – equivalent circuit parameters – phasor diagrams, losses – testing – efficiency and voltage regulation-all day efficiency-Sumpner's test, per unit representation– inrush current - three phase transformers-connections – Scott Connection – Phasing oftransformer– parallel operation of three phase transformers-auto transformer – tap changing transformers- tertiary winding.

UNIT III ELECTROMECHANICAL ENERGY CONVERSION AND CONCEPTS N ROTATING MACHINES 9

Energy in magnetic system – Field energy and coenergy-force and torque equations – singly and multiply excited magnetic field systems-mmf of distributed windings – Winding Inductances-, magnetic fields in rotating machines – rotating mmf waves – magnetic saturation and leakage fluxes.

UNIT IV DC GENERATORS 9

Construction and components of DC Machine – Principle of operation - Lap and wave windings-EMF equations– circuit model – armature reaction –methods of excitation-commutation and interpoles - compensating winding –characteristics of DC generators.

UNIT VDC MOTORS 9

Principle and operations - types of DC Motors – Speed Torque Characteristics of DC Motors-starting and speed control of DC motors –Plugging, dynamic and regenerative braking- testing and efficiency– Retardation test- Swinburne's test and Hopkinson's test - Permanent magnet dc motors(PMDC)-DC Motor applications.

TOTAL (L: 45+T:15): 60 PERIODS

OUTCOMES:

Ability to model and analyze electrical apparatus and their application to power system

TEXT BOOKS:

1. Nagrath I. J and Kothari D. P. 'Electric Machines', Fourth Edition, Tata McGraw Hill Publishing Company Ltd, 2010.
2. M.N.Bandyopadhyay, Electrical Machines Theory and Practice, PHI Learning PVT LTD., New Delhi, 2009.
3. Fitzgerald. A.E., Charles KingselyJr, Stephen D.Umans, 'Electric Machinery', Sixth edition, Tata McGraw Hill Books Company, 2003.

REFERENCES:

1. P. C. Sen., 'Principles of Electrical Machines and Power Electronics', John Wiley & Sons, 1997.
2. Syed A. Nasar, Electric Machines and Power Systems: Volume I, Mcgraw-Hill College; International Edition, January 1995.
3. Deshpande M. V., "Electrical Machines" PHI Learning Pvt. Ltd., New Delhi, 2011.
4. P.S. Bimbhra, 'Electrical Machinery', Khanna Publishers, 2003.
5. S.Sarma&K.Pathak "Electric Machines", Cengage Learning India (P) Ltd., Delhi, 2011.

CS6456 OBJECT ORIENTED PROGRAMMING L T P C

3 0 0 3

OBJECTIVES:

- To get a clear understanding of object-oriented concepts.
- To understand object oriented programming through C++.

UNIT I OVERVIEW 9

Why Object-Oriented Programming in C++ - Native Types and Statements –Functions and Pointers- Implementing ADTs in the Base Language.

UNIT II BASIC CHARACTERISTICS OF OOP 9

Data Hiding and Member Functions- Object Creation and Destruction- Polymorphism data abstraction: Iterators and Containers.

UNIT III ADVANCED PROGRAMMING 9

Templates, Generic Programming, and STL-Inheritance-Exceptions-OOP Using C++.

UNIT IV OVERVIEW OF JAVA 9

Data types, variables and arrays, operators, control statements, classes, objects, methods – Inheritance

UNIT V EXCEPTION HANDLING 9

Packages and Interfaces, Exception handling, Multithreaded programming, Strings, Input/Output

TOTAL : 45 PERIODS

OUTCOMES:

- Gain the basic knowledge on Object Oriented concepts.
- Ability to develop applications using Object Oriented Programming Concepts.
- Ability to implement features of object oriented programming to solve real world problems.

TEXT BOOKS:

1. **Ira Pohl, "Object-Oriented Programming Using C++", Pearson Education Asia, 2003.**
2. H.M.Deitel, P.J.Deitel, "Java : how to program", Fifth edition, Prentice Hall of India private limited, 2003.

REFERENCES:

1. Herbert Schildt, "The Java 2: Complete Reference", Fourth edition, TMH, 2002
2. **BjarneStroustrup, "The C++ Programming Language", Pearson Education, 2004.**
3. **Stanley B. Lippman and JoseeLajoie , "C++ Primer", Pearson Education, 2003.**
4. K.R.Venugopal, RajkumarBuyya, T.Ravishankar, "Mastering C++", TMH, 2003.

EE6402 TRANSMISSION AND DISTRIBUTION **LT P C**
3 0 0 3

OBJECTIVES:

- To develop expressions for the computation of transmission line parameters.
- To obtain the equivalent circuits for the transmission lines based on distance and operating
- Voltage for determining voltage regulation and efficiency. Also to improve the voltage profile of the transmission system.
- To analyses the voltage distribution in insulator strings and cables and methods to improve the same.
- To understand the operation of the different distribution schemes.

UNIT I STRUCTURE OF POWER SYSTEM **9**

Structure of electric power system: generation, transmission and distribution; Types of AC and DC distributors – distributed and concentrated loads – interconnection – EHVAC and HVDC transmission - Introduction to FACTS.

UNIT I TRANSMISSION LINE PARAMETERS **9**

Parameters of single and three phase transmission lines with single and double circuits - Resistance, inductance and capacitance of solid, stranded and bundled conductors, Symmetrical and unsymmetrical spacing and transposition - application of self and mutual GMD; skin and proximity effects - interference with neighboring communication circuits - Typical configurations, conductor types and electrical parameters of EHV lines, corona discharges.

UNIT IIIMODELLING AND PERFORMANCE OF TRANSMISSION LINES **9**

Classification of lines - short line, medium line and long line - equivalent circuits, phasor diagram, attenuation constant, phase constant, surge impedance; transmission efficiency and voltage regulation, real and reactive power flow in lines, Power - circle diagrams, surge impedance loading, methods of voltage control; Ferranti effect.

UNIT IV INSULATORS AND CABLES **9**

Insulators - Types, voltage distribution in insulator string, improvement of string efficiency, testing of insulators. Underground cables - Types of cables, Capacitance of Single-core cable, Grading of cables, Power factor and heating of cables, Capacitance of 3- core belted cable, D.C cables.

UNIT V MECHANICAL DESIGN OF LINES AND GROUNDING **9**

Mechanical design of transmission line – sag and tension calculations for different weather conditions, Tower spotting, Types of towers, Substation Layout (AIS, GIS), Methods of grounding.

TOTAL : 45 PERIODS

OUTCOMES:

Ability to understand and analyze power system operation, stability, control and protection.

TEXT BOOKS:

1. D.P.Kothari , I.J. Nagarath, 'Power System Engineering', Tata McGraw-Hill Publishing Company limited, New Delhi, Second Edition, 2008.
2. C.L.Wadhwa, 'Electrical Power Systems', New Academic Science Ltd, 2009.
3. S.N. Singh, 'Electric Power Generation, Transmission and Distribution', Prentice Hall of India Pvt. Ltd, New Delhi, Second Edition, 2011.

REFERENCES:

1. B.R.Gupta, ,S.Chand, 'Power System Analysis and Design'New Delhi, Fifth Edition, 2008.
2. Luces M.Fualken berry ,Walter Coffer, 'Electrical Power Distribution and Transmission', Pearson Education, 2007.
3. HadiSaadat, 'Power System Analysis,' PSA Publishing; Third Edition, 2010.
4. J.Brian, Hardy and Colin R.Bayliss 'Transmission and Distribution in Electrical Engineering', Newnes; Fourth Edition, 2012.
5. G.Ramamurthy, "Handbook of Electrical power Distribution," Universities Press, 2013.

EE6403 DISCRETE TIME SYSTEMS AND SIGNAL PROCESSING L T P C
3 0 0 3

OBJECTIVES:

To classify signals and systems & their mathematical representation.

To analyse the discrete time systems.

To study various transformation techniques & their computation.

To study about filters and their design for digital implementation.

To study about a programmable digital signal processor & quantization effects.

UNIT I INTRODUCTION 9

Classification of systems: Continuous, discrete, linear, causal, stable, dynamic, recursive, time variance; classification of signals: continuous and discrete, energy and power; mathematical representation of signals; spectral density; sampling techniques, quantization, quantization error, Nyquist rate, aliasing effect.

UNIT II DISCRETE TIME SYSTEM ANALYSIS 9

Z-transform and its properties, inverse z-transforms; difference equation – Solution by z-transform,application to discrete systems - Stability analysis, frequency response – Convolution – Discrete TimeFourier transform , magnitude and phase representation.

UNIT IIIDISCRETE FOURIER TRANSFORM & COMPUTATION 9

Discrete Fourier Transform- properties, magnitude and phase representation - Computation of DFT using FFT algorithm – DIT &DIF using radix 2 FFT – Butterfly structure.

UNIT IV DESIGN OF DIGITAL FILTERS 9

FIR & IIR filter realization – Parallel & cascade forms. FIR design: Windowing Techniques – Need and choice of windows – Linear phase characteristics. Analog filter design – Butterworth and Chebyshev approximations; IIR Filters, digital design using impulse invariant and bilinear transformation - mWarping, pre warping.

UNIT V DIGITAL SIGNAL PROCESSORS 9

Introduction – Architecture – Features – Addressing Formats – Functional modes - Introduction to Commercial DSProcessors.

TOTAL : 45 PERIODS

OUTCOMES:

Ability to understand and apply basic science, circuit theory, Electro-magnetic field theory control theory and apply them to electrical engineering problems.

TEXT BOOKS:

1. J.G. Proakis and D.G. Manolakis, 'Digital Signal Processing Principles, Algorithms and Applications', Pearson Education, New Delhi, PHI. 2003.
2. S.K. Mitra, 'Digital Signal Processing – A Computer Based Approach', McGraw Hill Edu, 2013.
3. Robert Schilling & Sandra L.Harris, Introduction to Digital Signal Processing using Matlab", Cengage Learning,2014.

REFERENCES:

1. Poorna Chandra S, Sasikala. B ,Digital Signal Processing, Vijay Nicole/TMH,2013.
2. B.P.Lathi, 'Principles of Signal Processing and Linear Systems', Oxford University Press, 2010
3. Taan S. ElAli, 'Discrete Systems and Digital Signal Processing with Mat Lab', CRC Press, 2009.
4. SenM.kuo, woonseng…s.gan, "Digital Signal Processors, Architecture, Implementations & Applications, Pearson,2013
5. DimitrisG.Manolakis, Vinay K. Ingle, applied Digital Signal Processing,Cambridge,2012
6. Lonnie C.Ludeman ,"Fundamentals of Digital Signal Processing",Wiley,2013

EE6404 MEASUREMENTS AND INSTRUMENTATION L T P C
3 0 0 3

OBJECTIVES:

- To introduce the basic functional elements of instrumentation
- To introduce the fundamentals of electrical and electronic instruments
- To educate on the comparison between various measurement techniques
- To introduce various storage and display devices
- To introduce various transducers and the data acquisition systems

UNIT I INTRODUCTION 9

Functional elements of an instrument – Static and dynamic characteristics – Errors in measurement – Statistical evaluation of measurement data – Standards and calibration.

UNIT IIELECTRICAL AND ELECTRONICS INSTRUMENTS 9

Principle and types of analog and digital voltmeters, ammeters, multimeters– Single and three phase wattmeters and energy meters – Magnetic measurements – Determination of B-H curve and measurements of iron loss – Instrument transformers – Instruments for measurement of frequency and phase.

UNIT IIICOMPARISON METHODS OF MEASUREMENTS 9

D.C & A.C potentiometers, D.C & A.C bridges, transformer ratio bridges, self-balancing bridges. Interference & screening – Multiple earth and earth loops - Electrostatic and electromagnetic interference – Grounding techniques.

UNIT IV STORAGE AND DISPLAY DEVICES 9

Magnetic disk and tape – Recorders, digital plotters and printers, CRT display, digital CRO, LED, LCD & dot matrix display – Data Loggers.

UNIT VTRANSDUCERS AND DATA ACQUISITION SYSTEMS 9

Classification of transducers – Selection of transducers – Resistive, capacitive & inductive transducers – Piezoelectric, Hall effect, optical and digital transducers – Elements of data acquisition system– A/D, D/A converters – Smart sensors.

TOTAL :45 PERIODS

OUTCOMES:

Ability to model and analyze electrical apparatus and their application to power system

TEXT BOOKS:

1. A.K. Sawhney, 'A Course in Electrical & Electronic Measurements & Instrumentation', DhanpatRai and Co, 2004.
2. J. B. Gupta, 'A Course in Electronic and Electrical Measurements', S. K. Kataria& Sons, Delhi, 2003.
3. Doebelin E.O. and Manik D.N., Measurement Systems – Applications and Design, Special Indian Edition, Tata McGraw Hill Education Pvt. Ltd., 2007.

REFERENCES:

1. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw Hill, II Edition 2004.
2. D.V.S. Moorthy, 'Transducers and Instrumentation', Prentice Hall of India Pvt Ltd, 2007.
3. A.J. Bouwens, 'Digital Instrumentation', Tata McGraw Hill, 1997.
4. Martin Reissland, 'Electrical Measurements', New Age International (P) Ltd., Delhi, 2001.
5. Alan. S. Morris, Principles of Measurements and Instrumentation, 2nd Edition, Prentice Hall of India, 2003.

CS6461 OBJECT ORIENTED PROGRAMMING LABORATORY **L T P C**
0 0 3 2

OBJECTIVES:

- To get a clear understanding of object-oriented concepts.
- To understand object oriented programming through C++ & JAVA.

LIST OF EXPERIMENTS:

C++:

1. program using functions with default arguments implementation of call by value, address, reference

2. simple classes for understanding objects, member functions &constructors classes with primitive data members ,classes with arrays as data members, classes with pointers as data members, classes with constant data members. classes with static member functions

3. Compile time Polymorphism operator overloading function overloading

4. Runtime Polymorphism inheritance virtual functions virtual base classes templates

5. file handling sequential access random access

JAVA:

6. simple java applications for understanding references to an instant of a class handling strings in JAVA
7. simple package creation developing user defined packages in java
8. interfaces developing user defined interfaces use predefined interfaces
9. Threading creation of threading in java applications multi-threading
10. exec java exceptions handling mechanism predefined
11. Exception handling mechanism in java Handling predefined exceptions handling user defined exceptions

TOTAL :45 PERIODS

OUTCOMES:

- Gain the basic knowledge on Object Oriented concepts.
- Ability to develop applications using Object Oriented Programming Concepts.
- Ability to implement features of object oriented programming to solve real world problems.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Standalone desktops with C++ complier 30 Nos. (or)
Server with C++ compiler supporting 30 terminals or more.

EE6411 ELECTRICAL MACHINES LABORATORY – I **L T P C**
0 0 3 2

OBJECTIVES :

To expose the students to the operation of D.C. machines and transformers and give them experimental skill.

LIST OF EXPERIMENTS:

1. Open circuit and load characteristics of DC shunt generator- critical resistance and critical speed.
2. Load characteristics of DC compound generator with differential and cumulative connections.
3. Load test on DC shunt and compound motor.
4. Load test on DC series motor.
5. Swinburne's test and speed control of DC shunt motor.
6. Hopkinson's test on DC motor – generator set.
7. Load test on single-phase transformer and three phase transformers.
8. Open circuit and short circuit tests on single phase transformer.
9. Polarity Test and Sumpner's test on single phase transformers.
10. Separation of no-load losses in single phase transformer.
11. Study of starters and 3-phase transformers connections

TOTAL: 45 PERIODS

OUTCOMES:

Ability to model and analyze electrical apparatus and their application to power system

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. DC Shunt Motor with Loading Arrangement – 3 nos
2. DC Shunt Motor Coupled With Three phase Alternator – 1 No.
3. Single Phase Transformer – 4 nos
4. DC Series Motor with Loading Arrangement – 1 No.
5. DC compound Motor with Loading Arrangement – 1 No.
6. Three Phase Induction Motor with Loading Arrangement – 2 nos
7. Single Phase Induction Motor with Loading Arrangement – 1 No.
8. DC Shunt Motor Coupled With DC Compound Generator – 2 nos
9. DC Shunt Motor Coupled With DC Shunt Motor – 1 No.
10. Tachometer -Digital/Analog – 8 nos
11. Single Phase Auto Transformer – 2 nos
12. Three Phase Auto Transformer – 1 No.
13. Single Phase Resistive Loading Bank – 2 nos
14. Three Phase Resistive Loading Bank. – 2 nos
15. SPST switch – 2 nos

K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM - 630 612

Format No.:11
Issue No.: 02
Revision No.: 01
Date: 23/06/12

Lecture Schedule[Mon:;Tue:;Wed:;Thu:;Fri:]

Degree/Programme: **B.E / EEE**
Course code &Name: **MA6459-Numerical Methods** Duration: **Jan -May 2017**
Semester: **IV** Section: **A,B&C** Staff :**Mrs.P.Dhanapriya** Regulation : **2013/AUC**

AIM: With the present development of the computer technology, it is necessary to develop efficient algorithms for solving problems in science, engineering and technology. This course gives a complete procedure for solving different kinds of problems occur in engineering numerically.

OBJECTIVES

At the end of the course, the students would be acquainted with the basic concepts in numerical methods and their uses are summarized as follows:

- The roots of nonlinear(algebraic and transcendental) equations, solutions of large system of linear equations and eigen value problem of a matrix can be obtained numerically where analytical methods fail togive solution.
- When huge amounts of experimental data are involved, the methods discussed on interpolation will be useful in constructing approximate polynomial to represent the data and to find the intermediate values.

COURSE OUTCOMES: After the course, the student should be able to:

CO	Course Outcomes	POs	Skill
C209.1	Determine the solution of algebraic and transcendal system of linear equations	a,b,e,h,j	Apply
C209.2	To interpolate the values of unknown functions using Newton's Formula	a,b,e,h,j	Apply
C209.3	Estimate the numerical values of the derivatives and integrals of unknown function	a,b,e,h,j	Apply
C209.4	Solve first and second order initial value problem	a,b,e,h,j	Apply
C209.5	Solve Numerically boundary value problem	a,b,e,h,j	Apply

S.No.	Date	Period	Topics to be covered	Book No(Page No)
Unit: I–Solution of Equations & Eigen ValueProblem Target Periods: 11+3= 14				
1			Numerical Methods - Introduction	T1: ---- T2: 8
2			Iterative method	T1: 3.3 T2: 12-15 R1: 81 – 88
3			Newton Raphson method for single variable	T1: 3.4 T2: 17-22 R1: 89 – 97
4			Tutorial-I	
5			Introduction to linear algebraic equations - Gauss Elimination method	T1: 4.1-4.2 T2: 38-43 R1: 112 – 114
6			Gauss - Jordan method	T1: 4.1-4.2 T2: 43-44 R1: 114 – 115
7			Gauss - Jacobi's method	T1: 4.5 T2: 48-50 R1: 145
8			Gauss - Seidel method	T1: 4.5 T2: 50-52 R1: 147
9			Tutorial-II	
10			Inverse of a matrix by Gauss Jordan method	T1: ----- T2: 57-59 R1: 3 – 7 (suppl.)
11			Eigen value of a matrix - power method	T1: 4.7 T2: 63-66 R1: 468 – 475

12			NPTEL Videos on application of Eigen value and eigen vectors	
13			Problem solving session	T1: 4.8 T2: 66-72 R1: 475 – 488
14			Tutorial-III	
Class Test 1:				
Assignment 2 : Date of announcement: Date of Submission:				
Unit-II: InterpolationTarget Periods: 11+3= 14				
15			Finite Difference Operators	T1: 5.1-5.3 T2: 94-104 R1: 170 – 183
16			Problem solving session	
17			Newton's Forward Difference Formula	T1: 5.1 T2: 104-108 R1: 211 - 213
18.			Problem solving session	
19.			Tutorial –I	
20			Newton's Backward Difference Formula	T1: 5.2 T2: 108-110 R1: 213 - 215
21			Problem solving session	
22			Lagrange's Interpolation Formula	T1: 7.6 T2: 110-113 R1: 271 – 275
23			Tutorial-II	
24			Problem solving session	
25			Divided Differences	T1: 7.1-7.3 T2: 113-120 R1: 251- 262
26			Problem solving session	
27			Interpolation with cubic spline	T1: 7.10 T2: 122-128 R1: 251- 262
28.			Tutorial- III	
CIT 1:				
Assignment 2 : Date of announcement: - Date of Submission:				
Unit-III : Numerical Differentiation &IntegrationTargetPeriods: 12+3= 15				
29.			Numerical Differentiation based on Interpolation formulae	T1:8.1-8.2 T2:145-147 R1: 281 - 296
30.			Numerical Integration - Trapezoidal Rule	T1: 8.28-8.32 T2:150-154 R1: 299 – 301
31			Tutorial-I	
32			Problem solving session	
33			Simpson's 1/3rd rule	T1: 8.28-8.32 T2:155-159 R1: 303 - 304
34			Simpson's 1/3rd rule	T1: 8.28-8.32 T2: ----- R1: 303 - 304
35			Romberg's method	T1: 8.33-8.34 T2:159-161 R1: 302
36			Seminar	
37			Tutorial-II	
38			Two and Three point Gaussian quadrature formulas	T1: T2:164-167 R1:
39			Numerical Double Integration - Trapezoidal Rule	T1:8.46-8.48 T2:161-163
40			Numerical Double Integration - Simpson's Rule	T1:8.46-8.48 R1: 315
41			Numerical Double Integration - Simpson's Rule	T1:8.46-8.48 R1: 315

42			Problem solving session	
43			Tutorial-III	
Class Test 2:				
Assignmen:3 Date of announcement:Date of Submission:				
Unit-IV : Initial Value Problems for ODE'sTargetPeriods: 12+3= 15				
44			Taylor's Series Method	T1:10.2-10.10 T2:177-179 R1 : 352 – 361
45			Problem solving session	
46			Euler's Method	T1:10.18-10.26 T2:179-181 R1: 369 - 377
47			Modified Euler's Method	T1:10.18-10.26 T2:181-183 R1: 369 - 377
48			Tutorial-I	
49			RungeKutta Method – I order ODE	T1:10.18-10.26 T2:183-190 R1 : 379 - 393
50			Problem solving session	
51			RungeKuttaMethid - II order ODE	T1:10.18-10.26 T2:183-190 R1 : 392 – 394
52			Tutorial-II	
53			Milne's Method	T1:10.35-10.39 T2:192-196 R1 : 395 - 400
54			Milne's Method	T1:10.35-10.39 T2:192-196 R1 : 395 - 400
55			Adam's Bashforth P – C Method	T1:10.40-10.41 T2:196-199 R1 : 404 - 408
56			Adam's Bashforth P – C Method	T1:10.40-10.41 T2:196-199 R1 : 404 - 408
57			Seminar	
58			Tutorial-III	
CIT 2 :				
Assignmen:4 Date of announcement:Date of Submission:				
Unit-V : Boundary Value problems for ODE's & PDE Target Periods: 11+3= 14				
59			Finite Difference solution for 2nd order ODE	T1: 10.60 T2:240-247 R1: 413 – 417
60			Problem solving session	
61			Tutorial-I	
62			Elliptic Equations (Laplace)	T1:11.1-11.9 T2:247-254 R1 : 419 - 434
63			Problem solving session	
64			Poisson's Equation	T1:11.10-11.16 T2:247-254 R1 : 435 - 440
65			Tutorial-II	
66			Parabolic Equation	T1: 11.22-11.39T2:216-227 R1 : 441 - 450
67			Problem solving session	
68			Hyperbolic Equation	T1: 11.22-11.39T2:257-261 R1 : 452 - 458
69			Problem solving session	
70			Tutorial-III	
71			Revision	
72			Revision	
Class Test-3 :				
Assignmen:5 Date of announcement:Date of Submission:				

Text Books/ Reference Books

S.no	Title of the Book	Author	Publisher	Year
1.	Numerical Methods with Programming in 'C'	Veerarajan.T and Ramachandran.T (T1)	Tata MC Graw Hill Publishers, 4th Edition	2007
2.	Numerical Methods for Scientists and Engineers	Shankar Rao.K (T2)	Princtice Hall of India Pvt. New Delhi, 3rd Edition	2007
3.	Numerical Methods	P. Kandasamy , K. Thilagavathy and K. Gunavathy (R1)	S Chand & Co.,	2003
4.	Applied Numerical Analysis	Gerald .C.F and Wheatley .P.O	Pearson Education Asia	2002

Course Outcomes (CO)	Program Outcome (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
C209.1	3	3	-	2	3	2	-	-	-	-	-	-	2	1	1
C209.2	3	3	-	2	3	2	-	-	-	-	-	-	2	1	1
C209.3	3	3	-	2	3	2	-	-	-	-	-	-	2	1	1
C209.4	3	3	-	2	3	2	-	-	-	-	-	-	2	1	1
C209.5	3	3	-	2	3	2	-	-	-	-	-	-	2	1	1
C209	3	3	-	2	3	2	-	-	-	-	-	-	2	1	1

NPTEL LECTURES

S. No	UNIT	Date[Period]	TOPIC	Ref / Link
1	I		Solution of Equations & Eigen ValueProblem	https://www.youtube.com/watch?v=pCaGHo0-dBs

Web site References:

1.	NPTEL Videos	https://www.youtube.com/watch?v=pCaGHo0-dBs
2.	Content Beyond Syllabus	https://www.youtube.com/watch?v=NXel87Do0bA

Content Beyond Syllabus Added(CBS)	POs strengthened / vacant filled	CO / Unit
Finite Difference Method for solving ODE-BVP	PO3 (Strengthened)	IV

PROGRAM OUTCOMES

Electrical and Electronics Engineering Graduates will be able to:

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

Electrical and Electronics Engineering Graduates will be able to:

PSO1: Apply the fundamentals of mathematics, science and engineering knowledge to identify, formulate, design and investigate complex engineering problems of electric circuits, analog and digital electronic circuits, electrical machines and power systems.

PSO2: Apply appropriate techniques and modern Engineering hardware and software tools in power systems to engage in life- long learning and to successfully adapt in multi disciplinary environments.

PSO3: Understand the impact of Professional Engineering solutions in societal and environmental context, commit to professional ethics and communicate effectively.

STAFF INCHARGE **HOD/Mathematics**

K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM 630 612

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Date: 23/06/12

Lecture Schedule

BATCH: **2015-2019** Academic Years: **2016-2017/even semester**
Branch : **EEE** Subject: **Electrical Machines-I**
Duration : **Jan '17 to April '17** Subject Code : **EE6401**
Semester : **IV** Section : **A,B & C** Staff Handling: **P.Loganthurai, S.P.Rajaram**
Regulation : **2013**

AIM

To expose the students to principle of operation and performance of electrical machines

OBJECTIVES

To impart knowledge on

(i) To introduce techniques of magnetic-circuit analysis and introduce magnetic materials

(ii)To familiarize the constructional details, the principle of operation, prediction of performance, the methods of testing the transformers and three phase transformer connections

(iii)To study the working principles of electrical machines using the concepts of electromechanical energy conversion principles and derive expressions for generated voltage and torque developed in all Electrical Machines

(iv) To study the working principles of DC machines as Generator types, determination of their no-load/load characteristics, starting and methods of speed control of motors.

(v) To estimate the various losses taking place in D.C. Motor and to study the different testing methods to arrive at their performance.

COURSE OUTCOMES: After the course, the student should be able to:

CO	Course Outcomes	POs	PSOs
C210.1	Describe the coupled coil calculate the self and mutually induced emf	**1,2,5**	**1**
C210.2	Analyze the operation of transformer in different loading condition	**1,2,4,5**	**1**
C210.3	Explain the concept of field energy and co-energy in single and multiple excited systems	**1,2,5**	**1**
C210.4	Demonstrate the construction of D.C machines and operation of DC Generator	**1,2,5**	**1**
C210.5	Derive the performance equation of D.C motor under various load condition and analyze the braking system	**1,2,4,5**	**1**

S.No	Date	Period	Topics to be Covered	Book No [Page No]
UNIT I - MAGNETIC CIRCUITS AND MAGNETIC MATERIALS **Target periods : 12**				
1			Magnetic circuits –Laws governing magnetic circuits	1(12-16)
2			Flux linkage, Inductance and energy	1(17-20)
3			Statically and Dynamically induced EMF and Torque	1(30-34)
4				
5			Properties of magnetic materials	1(25-27)
6			AC operation of magnetic circuits	1(31-32)
7			Hysteresis and Eddy Current losses	1(33-35)
8			Introduction to permanent magnets	1(35-36)
9			Transformer as a magnetically coupled circuit	1(38-39)
10			Tutorial_1	
11			Tutorial_2	
12			Tutorial_3	
Total period		12	Assignment – 1 Date of Submission :	
UNIT II - TRANSFORMERS **Target periods : 12**				
13			Construction – principle of operation phasor diagrams.	1(54-62)2(2-4)
14			Equivalent circuit parameters	1(62-71)

				2(20-28)
15			Losses –O.C&SC test – efficiency Sumpner's test- test	1(71-91)
16			voltage regulation per unit representation – inrush current	2(29-34,66-70)
17			Three phase transformer connections	1(101-106)
18			Scott Connection – Phasing of transformer	1(124-125)
19			Parallel operation of transformers	1(116-120)
20			Tap changing on transformers	1(127-131)
21			Auto transformer	1(94-97)
22			Student seminar-I-Protective system in transformer	
23			Quiz-I	
24			Tutorial_1	
25			Tutorial_2	
26			Tutorial_3	
Total period		14	Assignment – 2 Date of Submission :	
Test-II-CIT-I-[12-18 Feb 2015]				
UNIT III ELECTROMECHANICAL ENERGY CONVERSION AND CONCEPTS IN ROTATING MACHINES Target periods : 12				
27			Energy in magnetic system	1(158-160) 2(161-164)
28			Field energy and co energy-force and torque equations.	1(161-172)
29				
30			Singly excited systems.	1(173-176) 2(164-184)
31			Multiply excited systems.	1(176-178)
32				2(185-202)
33			MMF of distributed windings– Winding Inductances	1(216-223) 2(285-293)
34			Magnetic fields in rotating machines, Rotating MMF waves	2(223-229), 1(223-239)
35			Magnetic saturation and leakage fluxes	1(247-249)
36			Tutorial_1	
37			Tutorial_2	
38			Tutorial_3	
Total period		12	Assignment – 3 Date of Submission :	
UNIT IV - DC GENERATORS Target periods : 12				
39			Construction and Principle of operation of	1(285-287)
40			D.C.Generator	2(360-365)
41			Lap and wave windings-EMF equations	1(287-302)
42			Circuit model	1(305-307)
43			Armature reaction, methods of excitation-	1(310-315,318-
44			Commutation	324)
45			interlopes -compensating winding	1(316-318)
46			Characteristics of DC generators	1(326-329)
47				2(429-435)
48			Student seminar-II	
49			Quiz-II	
50			Tutorial_1	
51			Tutorial_2	
52			Tutorial_3	
Total period		14	Assignment – 4 Date of Submission :	
UNIT V – DC MOTORS Target periods : 12				
53			Principle and operations - types of DC Motors	1(285-287)
54			Characteristics of Motors	1(361-367)
55			Starting and speed control DC motors	1(381-405)
56			Plugging, dynamic and regenerative braking	1(408-410)
57			Methods of excitation	1(337-340)

58			Retardation test- Swinburne's test	1(412-415)
59			Hopkinson's test	1(419-421)
60			Permanent magnet dc motors(PMDC)-	1(426-429)
61			DC Motor applications	1(430)
62			Student seminar-III	
63			Quiz-III	
64			Tutorial_1	
65			Tutorial_2	
66			Tutorial_3	
Total period		14	Assignment – 5 Date of Submission :	

Book Reference - Text Books

Sl	Title of the Book	Author	Publisher	Year
1.	Electric Machines	Nagrath, I.J. and Kothari, D.P	Tata McGraw Hill, Fourth Edition	2010.
2.	Electrical Machines Theory and Practice	M.N.Bandyopadhyay.	PHI Learning PVT LTD., New Delhi	2009.
3	Electric Machinery	Fitzgerald. A.E., Charles Kingsely Jr, Stephen D.Umans	Tata McGraw Hill Books Company, Sixth edition	2003

Book Reference – References

Sl	Title of the Book	Author	Publisher	Year
1.	Principles of Electrical Machines and Power Electronics	Sen, P.C.,	John Wiley and Sons,	1997.
2.	Electric Machines and Power Systems: Volume I	Syed A. Nasar	Mcgraw-Hill College; International Edition,	1995
3.	Electrical Machines	Deshpande M. V	PHI Learning Pvt. Ltd., New Delhi	2011
4	Electrical Machinery	P.S. Bimbhra	Khanna Publishers,	2003.
5	Electric Machines	S.Sarma & K.Pathak	Cengage Learning India (P) Ltd., Delhi	2011

Net Reference

http://nptel.iitm.ac.in/courses.php?branch=Electrical

www.freebookspot.com

Mapping of Course Outcomes (COs) , Course (C), Program Specific Outcomes (PSOs) with Program Outcomes. (POs) – Before CBS

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C210.1	3	2	-	-	1	-	-	-	-	-	-	-	1	-	-
C210.2	3	2	-	2	1	-	-	-	-	-	-	-	2	-	-
C210.3	3	2	-	-	1	-	-	-	-	-	-	-	1	-	-
C210.4	3	2	-	-	1	-	-	-	-	-	-	-	1	-	-
C210.5	3	2	-	2	1	-	-	-	-	-	-	-	2	-	-
C210	3	2	-	1	1	-	-	-	-	-	-	-	1	-	-

Content Beyond Syllabus Added(CBS)	POs strengthened / vacant filled	CO / Unit
Assembling and testing of transformer	PO6,PO7 (vacant filled)PSO2(1) PO4 &PO5(strengthened)	C210.2/II C210.3 / III

STAFF INCHARGE **HOD/EEE**

Format No.:11 Issue No.: 02 Revision No.: 01 Date: 23/06/12

K.L.N. COLLEGE OF ENGINEERING
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
LECTURE SCHEDULE

Course/Branch : **B.E./EEE** Subject :**OBJECT ORIENTED PROGRAMMING**
Duration :**Jan'17 to April'17** Subject Code : **CS6456** Year/Semester :**II/IV**
Sec:**A,B,C** Staff Handling:**Mr.A.Manoj, Ms.J.Merlin, Ms.M.S.C.Sujitha**
Regulation: **2013** AUC/~~AUT/AUM~~: **AUC**

AIM :

1) To get a clear understanding of object-oriented concepts. 2) To understand object oriented programming through C++

OBJECTIVE:

1. To study the fundamentals of object oriented programming approach
2. To study the concept of polymorphism and inheritance and programming the same
3. Understanding the concept of templates, generic programming and STL etc.
4. To study the fundamentals of Java and virtual machines, JDK, Javadoc and packages.
5. Understanding the OOP concept like inheritance and multithreaded programming the same in Java.

COURSE OUTCOMES: After the course, the student should be able to:

C211.1	Explain the key attributes of C++ like native types and statements and implement ADT.	**POs**	**PSOs**
C211.2	Develop object oriented programs using polymorphism and data abstraction concepts.	**1,2,3,4,5**	**1 -**
C211.3	Design templates, construct generics and to handle exceptions.		**2 1**
C211.4	Develop the concept of java in creating classes, objects using arrays and control statements.		**2 1**
C211.5	Create packages, handle exceptions and develop multi-threaded programs.		**2 1**
			2 1

S.No	Date	Period Number	Topics to be Covered	Book No [Page No]
UNIT I : OVERVIEW				**Target periods : 9**
1.			Introduction of object oriented programming in C++	R1(19-40)
2.			Native types	R1(41-62)
3.			Statements	R1(62-71)
4.			Functions	R1(79-95)
5.			Pointers	R1(96-115)
6.			Implementing ADTs in the Base Language	R1(125-148)
Assignment - I				
CIT: I				
UNIT II : BASIC CHARACTERISTICS OF OOP				**Target periods : 9**
7.			Data Hiding and Member Functions	R1(155-178)
8.			Object Creation and Destruction ***[NPTEL]***	R1(185-220)
9.			Polymorphism	R1(229-264)
10.			Iterators and Containers	R1(273-290)
11.			Runtime polymorphism.	R1(229-263)
12.			Quiz	
CIT – II :				
UNIT III : ADVANCED PROGRAMMING				**Target Periods : 9**
13.			Templates	R1(295-303)
14.			Generic Programming	R1(303-312)
15.			Standard Template Library(STL)	R1(313-334)

16.			Inheritance	R1(339-368)
17.			Exceptions	R1(375-396)
18.			OOP using C++	R1(399-416)
Assignment : 2 ***CIT - III***				
UNIT IV : OVERVIEW OF JAVA				**Target Periods: 9**
19.			Introduction to Java	R2(1-41)
20.			Data types, Variables	R2(43-59)
21.			Arrays	R2(153-161)
22.			Operators	R2(60-77)
23.			Control Statements	R2(81-121)
24.			Classes, objects, methods	R2(126-137)
25.			Inheritance	R2(137-142)
CIT – IV ***Assignment :3****DOS :*				
UNIT V : EXCEPTION HANDLING				**Target Periods: 9**
26.			Packages and Interfaces	R2(181-204)
27.			Exception Handling	R2(230-241)
28.			Multithreaded Programming	R2(207-226)
29.			Strings	R2(162-165)
30.			Input / Output	R2(287-295)
31.			Seminar	
Content beyond syllabus				
CIT – V				

Book References:

Book No	Title of the Book	Author	Publisher	Year
R1.	Object Oriented Programming Using C++	Ira Pohl	Pearson Education, second edition	2008
R2.	Programming with Java – a Primer	E Balagurusamy	The McGraw Hill Companies Third edition	2007
R3.	Programming with ANSI C++	Trivedi.B	Oxford University Press	2007
R4.	Object Oriented Programming	A.A.Puntambekar	Technical Publications	2013
R5.	"Java: how to program"	H.M.Deital, P.J.Deital	Prentice Hall of India Private Ltd, fifth edition	2003

Website Reference

1.http://www.tutorialspoint.com/cplusplus/cpp_quick_guide.htm

2.http://nptel.ac.in/courses/106105151/

3.http://www.nptelvideos.com/java/java_video_lectures_tutorials.php

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C211.1	2	-	-	-	-	-	-	-	-	-	-	-	1	-	-
C211.2	2	1	2	3	2	-	-	-	-	-	-	-	2	1	-
C211.3	2	1	2	3	2	-	-	-	-	-	-	-	2	1	-
C211.4	2	1	2	3	2	-	-	-	-	-	-	-	2	1	-
C211.5	2	1	2	3	2	-	-	-	-	-	-	-	2	1	-
C211	2	1	2	2	2	-	-	-	-	-	-	-	2	1	-

Content Beyond Syllabus Added(CBS)	POs strengthened / vacant filled	CO / Unit
Orientation Program in JAVA (backend and graphics)	PO2(2)(Strengthened)	C211.5/ V

STAFF IN-CHARGE **HOD/EEE**

K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM - 630 612

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Format No.:11
Issue No.: 02
Revision No.: 01
Date: 23/06/12

Lecture Schedule

Course/Branch : **B.E / EEE** Subject: **Transmission & Distribution** Duration: **Jan - Apr 2017**
Subject Code : **EE6402** Semester: **IV** Section: **A,B&C** Regulation: **2013**
Staff Handling: **DR.A.S.S.MURUGAN, A.P.S. RAMALAKSHMI, M.BHARANI LAKSHMI**

AIM

To understand the importance and the functioning of transmission and distribution of the electric power in an electrical utility (or) a power system.

OBJECTIVES

1. To develop expressions for the computation of transmission line parameters.
2. To obtain the equivalent circuits for the transmission lines based on distance and operating voltage for determining voltage regulation and efficiency. Also to improve the voltage profile of the transmission system.
3. To analyses the voltage distribution in insulator strings and cables and methods to improve the same.
4. To understand the operation of the different distribution schemes.

COURSE OUTCOMES: After the course, the student should be able to:

Course	Course Outcome	POs	PSOs
C212.1	List the basic elements of the electric power system, generation, transmission, distribution and describe the role played by each element	1,2	1
C212.2	Determine the losses, efficiency and parameters of the Transmission line.	1,2,4,6,7	1,3
C212.3	Analyze the Performance of Transmission Lines.	1,2,4,6,7	1,3
C212.4	Solve the voltage distribution in insulator strings, cables and methods to improve the same.	1,2,6,7,8	1,3
C212.5	Design overhead lines both Mechanical and electrical aspects using Sag calculation.	1,2,4,6,7	1,3

S.No	Date	Period Number	Topics to be Covered	Book No [Page No]
UNIT I: STRUCTURE OF POWER SYSTEM				**Target Periods : 9**
1			Structure of electric power system different operating voltages of generation, transmission and distribution	1(14 - 16)
2			Types of AC distributors and concentrated loads	3 (512 - 514)
3				
4			Tutorial -1	-
5			Tutorial -2	-
6			Types of DC distributors and Concentrated loads.	1 (887 - 896) 3 (503 - 508)
7				
8			Tutorial -3	-
9			Interconnection of EHVAC Transmission	3 (469 - 481)
10			Interconnection of HVDC transmission	1 (860 - 872)
11			An introduction to FACTS	2 (713 - 715) 3 (837 - 840)
12			Static Var Compensator, Thyristor controlled series capacitor, STATCOM,UPFC	
Test-I-Class test – I				**Total Periods: 12**
UNIT II: TRANSMISSION LINE PARAMETERS				**Target Periods : 9**
13			Parameters of single and three phase transmission lines with single and double circuitsResistance, inductance and capacitance of solid conductor	1 (95 - 106) 3 (15 -23)
14				
15			Stranded And Bundled Conductors	1 (119)
16			Tutorial-1	-
17			Symmetrical and Unsymmetrical spacing – transposition of lines of inductance	1 (109 - 113) 3 (24 - 26)
18			Symmetrical and Unsymmetrical spacing – transposition of lines of Capacitance	1 (127 - 134) 3 (30 - 38)
19			Tutorial-2	-
20			Tutorial-3	-
21			Concepts of GMR and GMD	1 (106)
22			Skin and Proximity effects	1 (122 - 123)

23			Interference with neighbouring communication circuits.	1 (123, 143), 3 (38 – 41, 195 - 202)
24			Corona discharge characteristics, critical voltage and loss. (Simple diagrams of typical towers and conductors for 400, 220 and 110 kV operations)	1 (852 - 857) 3 (180 - 188)
25			Quiz-1	-
Assignment 1			*Date of Announcement(DOA) : Date Of Submission(DOS) :*	
Test-II- CIT-I				**Total Periods: 12 + 1**
UNIT III: MODELLING AND PERFORMANCE OF TRANSMISSION LINES				**Target Periods : 9**
26			Classification of Transmission lines Short, medium and long line	1 (177 - 194) 3 (78 – 103,111)
27			Equivalent circuits – phasor diagram	
28			Attenuation constant, phase constant, surge impedance	
29			Transmission Efficiency and Voltage regulation	
30				
31			Tutorial-1	-
32			Tutorial-2	-
33			Real and Reactive power flow in lines	1 (207 - 211) 3 (108 - 110)
34			Power-circle diagrams	1 (217 - 220) 3(114 - 116)
35			Tutorial-3	-
36			Surge impedance loading,	1 (200 - 201) 3 (470)
37			Ferranti effect	1 (204 -207) 3 (105)
38			Methods of voltage control	1 (223 - 231) 2 (228 - 235)
Assignment - 2	*DOA:*	*DOS:*	*Test-III-Class test II*	**Total Periods: 13**
UNIT IV: INSULATORS AND CABLES				**Target Periods : 9**
39			Classification of insulators for transmission and distribution purpose	1 (829 -832) 2 (174 - 181)
40			Voltage distribution in insulator string	
41			Tutorial-1	-
42			Improvement of string efficiency,	1 (832 - 837)
43			Testing of insulators	2 (181 - 183)
44			Tutorial-2	-
45			Quiz –2	-
46			Underground cables ,Types of cables	1 (810 - 813) 2 (190 - 193)
47			Capacitance of single core cable	1 (813 - 819)
48			Grading of cables	2 (193 - 200)
49			Tutorial-3	-
50			Power factor and heating of cables,	1 (822 - 823) 2 (207 - 218)
51			Capacitance of 3-core belted cable, DC cable.	1 (823 - 826) 2 (204 -206)
Assignment - 3			*Date of Announcement :* *Date Of Submission:*	
Test-IV-CIT – II				**Total Periods: 12 +1**
UNIT V: MECHANICAL DESIGN OF LINES AND GROUNDING				**Target Periods : 9**
52			Mechanical design of transmission line	2 (154 - 156)
53				
54			Sag and Tension calculations for different weather conditions	2(156 - 170)
55				
56			Tutorial-1	-
57			Tutorial-2	-
58			Tutorial-3	-
59			Tower spotting, Types of towers	3(291-292)
60			Substation Layout of AIS	3(391-392)
61			Substation Layout of GIS	3(393-394)
62			Methods of grounding	2 (247 - 256)
63				
64			Seminar	-
65			***Content beyond Syllabus:*** Safety Precautions in Transmission	-

			Lines	
66			**NPTEL Video**	-
Test-V-Class test III				**Total Periods: 12+ 1 + 2**

Books: Text/Reference

S. No	Title of the Book	Author	Publisher	Year
1	Power System Engineering (T)	D.P.Kothari , I.J. Nagarath	Tata McGraw-Hill Publishing Company limited, New Delhi	2008
2	Electrical Power Systems (T)	C.L.Wadhwa	New Academic Science Ltd	2010
3	Power System Analysis and Design (R)	B.R.Gupta	S.Chand ,New Delhi	2014
4	Electric Power Generation, Transmission and Distribution (T)	S.N. Singh	PHI, New Delhi	2011
5	Transmission and Distribution in Electrical Engineering (R)	J.Brian, Hardy and Colin R.Bayliss	Newnes; Fourth Edition	2012
6	Electrical Power Distribution and Transmission (R)	Luces M.Fualkenberry, Walter Coffer	Pearson Education	2007
7	Power System Analysis	HadiSaadat	Tata McGraw Hill	2010
8	Handbook of Electrical power Distribution (R)	G.Ramamurthy	Universities Press,	2013

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C212.1	3	3	-	-	-	-	-	-	-	-	-	-	2	-	-
C212.2	3	3	-	1	-	2	3	-	-	-	-	-	2	-	1
C212.3	3	3	-	1	-	2	3	-	-	-	-	-	2	-	1
C212.4	3	3	-	-	-	3	3	1	-	-	-	-	2	-	1
C212.5	3	3	-	1	-	2	3	-	-	-	-	-	2	-	1
C212	3	3	-	1	-	2	2	-	-	-	-	-	2	-	1

Content Beyond Syllabus Added(CBS)	POs strengthened / vacant filled	CO / Unit
Safety Precautions in Transmission Lines	PO6(3) strengthened/ PO8(1) (Vacant filled)	C212.4/IV

WEB REFERENCE:

1. http://nptel.ac.in/video.php?subjectId=108102047
2. http://nptel.ac.in/courses/108102047

STAFF INCHARGE **HOD/EEE**

K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM - 630 612
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Format No.:11
Issue No.: 02
Revision No.: 01
Date: 23/06/12

Lecture Schedule

Course/Branch : **B.E / EEE**Subject: **Discrete Time Systems & Signal Processing**Duration: **Jan-Apr 2017**
Subject Code : **EE6403** Semester: **IV** Section: **A, B & C** Regulation: **2013 (AUC)**
Staff Handling: **S. Rajalingam, M. Ganesh Kumari& R. Divya**

AIM

To introduce the concept of analyzing discrete time signals & systems in time and frequency domain.

PRE-REQUISITE: Digital Logic Circuits

OBJECTIVES

- To classify signals and systems & their mathematical representation.
- To analyze the discrete time systems.
- To study various transformation techniques & their computation.
- To study about filters and their design for digital implementation.
- To study about a programmable digital signal processor & quantization effects

COURSE OUTCOMES: After the course, the student should be able to:

Course	Course Outcome	POs	PSOs
C213.1	Classify the different types of signals and systems and Explain the sampling process of continuous time signal.	1,2,3,5,12	1,2
C213.2	Apply z-transform and inverse Z transform and analyze discrete time systems.	1,2,3,5,12	1,2
C213.3	Apply Radix-2 Decimation in Time (DIT) and Decimation in Frequency(DIF)FFT Algorithm to Compute Discrete Fourier Transform.	1,2,3,5,12	1,2
C213.4	Explain different types of Infinite Impulse Response (IIR) filters and Finite Impulse Response (FIR) filters.	1,2,3,5,12	1,2
C213.5	Explain various architectures of Digital signal processors.	1,2,3,5,12	1,2

S. No.	Date	Period Number	Topics to be Covered	Book No [Page No]
UNIT I - INTRODUCTION			**Target periods :9+3+1**	
1.			Introduction	T1[1-5], R2[1.1]
2.			Classification of Systems: Continuous, Discrete, Linear, Causal, Stable	R2[1.52], T2[100]
3.			Classification of Systems: Dynamic, Recursive, Time variance	R2[1.52]
4.			Classification of Signals: Continuous and Discrete	T1[6-11], R2[1.3]
5.			Classification of Signals: Energy & Power signals	T1[6-11], R2[1.33]
6.			Mathematical Representation of Signals	R2[1.28]
7.			Spectral Density, Sampling Techniques, Quantization, Quantization Error	T1[21], T1[31-35], R2[1.173]
8.			Nyquist Rate, Aliasing effect	T1[28], T1[20], R2[1.170]
9.			Digital Signal representation	R2[1.29]
10.			Tutorial 1	-
11.			Tutorial 2	-
12.			Tutorial 3	-
13.			Technical Quiz-I	-
ASSIGNMENT – I				
CLASS TEST – I				
UNIT II - DISCRETE TIME SYSTEM ANALYSIS			**Target periods :9+3**	
14.			Introduction to Z Transform	T1[147], R2[2.1]
15.			Properties of Z Transform	T1[157], R2[2.8]
16.			Inverse Z Transform: Long Division & Partial Fraction method	T1[157], R2[2.30]
17.			Inverse Z Transform: Residue & Convolution method	T1[156] R2[2.40]
18.			Solution to Difference equation using Z Transform, Application to discrete systems	R2[2.52]
19.			Stability Analysis	R2[2.7]

20.			Frequency Response	T2[146] R2[1.129]
21.			Convolution	T1[69] R2[1.60]
22.			Discrete Time Fourier Transform, Magnitude & Phase representation	R2[3.5] R2[3.1]
23.			Tutorial 1	-
24.			Tutorial 2	-
25.			Tutorial 3	-
ASSIGNMENT – II				
CENTRALIZED INTERNAL TEST – I				
UNIT III - DISCRETE FOURIER TRANSFORM &COMPUTATION				**Target Periods: 10+3+1**
26.			Properties of Discrete Fourier Transform	T1[464] R2[3.25]
27.				
28.			Magnitude & Phase representation of Discrete Fourier Transform	R2[3.9]
29.			Introduction to FFT Algorithm	T1[519] R2[4.1]
30.			Introduction to Butterfly Structure	R2[4.5]
31.			Introduction to Radix 2 Decimation in Time(DIT) Algorithm	R2[4.3]
32.			Computation of DFT using Radix 2 DIT Algorithm	R2[4.11]
33.			Computation of DFT using Radix 2 DIT Algorithm	R2[4.11]
34.			Introduction to Radix 2 Decimation in Frequency(DIF) Algorithm	R2[4.21]
35.			Computation of DFT using Radix 2 DIF Algorithm	R2[4.27]
36.			Tutorial 1	-
37.			Tutorial 2	-
38.			Tutorial 3	-
39.			Technical Quiz-II	-
CLASS TEST – II				
UNIT IV - DESIGN OF DIGITAL FILTERS				**Target Periods: 10+3+1**
40.			Realization of IIR Filters – Direct form I, II	R2[5.54]
41.			Realization of FIR Filters – Parallel & Cascaded form	T1[567] R2[6.102]
42.			Introduction to Windowing Technique – Need& Choice	R2[6.29]
43.			Design of FIR Filters Using Windowing Technique.	R2[6.29]
44.				
45.			Linear phase characteristics of FIR Filters	R2[6.1]
46.			Design of Analog IIR Filter by Butterworth &Chebyshev Approximations	R2[5.6] R2[5.17]
47.			Design of Digital IIR Filter by Impulse Invariant	R2[5.33]
48.			Design of Digital IIR Filter by Bilinear Transformation	R2[5.33]
49.			Warping & Pre-warping effect	R2[5.29]R2[5.52]
50.			Tutorial 1	-
51.			Tutorial 2	-
52.			Tutorial 3	-
53.			**Content beyond Syllabus:** Computer Aided Design of Digital Filter	T2[631]
ASSIGNMENT – III				
CENTRALIZED INTERNAL TEST – II				
UNIT V – DIGITAL SIGNAL PROCESSORS				**Target Periods :9+1**
54.			Introduction to Digital Signal Processors	R2[11.1]
55.			Features of Digital Signal Processors	R2[11.5]
56.			Von Neumann Architecture	R2[11.8]
57.			Harvard Architecture	R2[11.9]
58.			VLIW Architecture	R2[11.10]
59.			Addressing Formats of Digital Signal Processors	R2[11.25]
60.			Addressing Formats of Digital Signal Processors	R2[11.25]
61.			Functional modes of Digital Signal Processors	R2[11.25]
62.			Introduction to Commercial processors	R2[11.1]
63.			Technical Seminar-I	-
CLASS TEST – III				

Books: Text/Reference

Book No	Title of the Book	Author	Publisher	Year
T1	Digital Signal Processing Principles, Algorithms and Applications	J.G. Proakis& D.G. Manolakis	Pearson Education, New Delhi	2003
T2	Digital Signal Processing – A Computer Based Approach	S.K. Mitra	Tata McGrawHill, New Delhi	2001
R1	Digital Signal Processing	S.Salivahanan, A.Vallavaraj, C.Gnanapriya	Tata McGraw Hill, New Delhi	2003
R2	Digital Signal Processing	P. Ramesh Babu	Scitech Publishers	2014 Sixth Edition

NPTEL LECTURES

S.No	UNIT	Date[Period]	TOPIC	Ref / Link
1	III		FFT	http://www.youtube.com/watch?v=vlFdVYAXIxg
2	V		Digital signal processors	http://www.youtube.com/watch?v=SKuywStjBLY

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C213.1	3	2	2	-	1	-	-	-	-	-	-	1	2	1	-
C213.2	3	2	2	-	1	-	-	-	-	-	-	1	2	1	-
C213.3	3	2	2	-	1	-	-	-	-	-	-	1	2	1	-
C213.4	3	2	2	-	1	-	-	-	-	-	-	1	2	1	-
C213.5	3	2	2	-	1	-	-	-	-	-	-	1	2	1	-
C213	3	2	2	-	1	-	-	-	-	-	-	1	2	1	-

Content Beyond Syllabus Added(CBS)	POs strengthened / vacant filled	CO / Unit
Computer Aided Design of Digital Filter: Design features- Finding suitable tool- Method of design-Verification	PO5 (Strengthened)	C213.4 / IV

STAFF INCHARGE **HOD/EEE**

K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM - 630 612
Department of Electrical and Electronics Engineering
Lecture Schedule

Format No.:11
Issue No.: 02
Revision No.: 01
Date: 23/06/12

Degree/Programme : **B.E / EEE** Semester :**IV** Section : **A,B &C**
Course code &Name :**EE6404 & Measurements and Instrumentation** Regulation : **2013/AUC**
Staff :**M. Jeyamurugan, K.R. Jeyavelumani, Dr.C.Vimalarani** Duration : **Jan-Apr 2016.**

AIM: To provide adequate knowledge in electrical instruments and measurements techniques.

OBJECTIVE:

- To introduce the basic functional elements of instrumentation
- To introduce the fundamentals of electrical and electronic instruments
- To educate on the comparison between various measurement techniques
- To introduce various storage and display devices
- To introduce various transducers and the data acquisition systems

Prerequisites: Circuit Theory, Electronic Devices and Circuits, Linear Integrated Circuits and Applications

COURSE OUTCOMES: After the course, the student should be able to:

Cos	Course Outcomes	POs	PSOs
C214.1	Describe the basic functional block elements in Different measuring Instruments and the errors in the measurement system	1,2	1
C214.2	Select the suitable instrument for measuring different electrical and magnetic parameters	1,2,3	1
C214.3	Design a suitable Bridge circuit to determine the values of various resistor, inductor and capacitor	1,2,3,4	1
C214.4	Explain the construction and working principle of various types of storage and display devices and compare them	1,7	-
C214.5	Compare the various types of transducers and explain the function of different blocks involved in data acquisition systems	1,5	2

Total : 45 Periods

S. No	Date	Period Number	Topics to be Covered	Book No [Page No]	
UNIT-I: INTRODUCTION					**Target periods : 9**
1			Introduction	T1[1]	R6[1.2,43]
2			Functional elements of an instrument	T1[7]	R6[1.3]
3			Static characteristics	T1[19]	R6[1.7]
4			Static characteristics	T1[19]	R6[1.8]
5			Dynamic characteristics	T1[81]	R6[1.21]
6			Errors in measurement	T1[49]	R6[1.54]
7			Statistical evaluation of measurement data	T1[57]	R6[1.58]
8			Standards	T1[142]	R6[1.52]
9			Calibration	T1[182]	R6[1.50]
Total Periods:		**9**	***Assignment - I***	*Date of Submission :*	
			Test – I: Class Test-I	***Portion :*** *Unit – 1*	
UNIT-II: ELECTRICAL AND ELECTRONICS INSTRUMENTS					**Target periods : 9**
10			Principle and Types of analog and digital voltmeter	T1[237]	R6[2.3,63]
11			Principle and Types of analog and digital ammeter	T1[241]	R6[2.23]
12			Principle and Types of analog and digital multimeter	T1[297]	R6[2.8]
13			Single and three phase watt meter	T1[351,371]	R6[2.58]
14			Single and three phase energy meter	T1[380]	R6[2.47]
15			Magnetic measurements	T1[541]	R6[2.93]
16			Determination of B-H curve and measurements of iron loss	T1[544,556]	R6[2.94]
17			Instrument transformers	T1[313]	R6[2.118]
18			Instruments for measurement of Frequency	T1[410]	R6[2.129]
19			Instruments for measurement of phase	T1[417]	R6[2.144]
Total Periods:		**10**	***Assignment - II***	*Date of Submission :*	
			Test – II: CIT-I	***Portion :*** *Unit – 1,II*	
UNIT-III: COMPARISON METHODS OF MEASUREMENTS					**Target Periods : 9**
20			D.C Potentiometers	T1[455]	R6[3.2]
21			A.C Potentiometers	T1[467]	R6[3.30]

22			D.C Bridges	T1[421]	R6[4.2]
23			A.C Bridges	T1[479]	R6[4.34]
24			Transformer ratio bridge & Self- balancing bridge	T1[503]	R6[4.72]
25			Interference and Screening	T10[3.61,73]	R6[4.80]
26			Multiple earth and earth loops	T1[443]	R6[4.88]
27			Electrostatic and electromagnetic interference	T10[3.75]	R6[4.85]
28			Grounding techniques	-	R6[4.92]
Total Periods:		**9+1 = 10**	***Assignment - III***	*Date of Submission :*	
			Test – III : Class Test-II	***Portion :*** *Unit – III*	
UNIT-IV: STORAGE AND DISPLAY DEVICES					**Target Periods: 9**
29			Magnetic disk and tape – Recorders	T1[1041]	R6[5.6]
30			Digital plotters	R1[352]	R6[5.5]
31			Digital Printers	R1[52]	R6[5.21]
32			CRT display	T1[641]	R6[5.27]
33			Digital CRO	T1[672]	R6[5.57]
34			LED	T1[1012]	R6[5.73]
35			LCD	T1[1013]	R6[5.80]
36			Dot matrix display	T1[1011]	R6[5.84]
37			Data loggers	-	R6[7.12]
38			*Quiz*		
Total Periods:		**9+2 = 11**	***Test – IV: CIT-II***	***Portion :*** *Unit – III, IV*	
UNIT-V: TRANSDUCERS AND DATA ACQUISITION SYSTEMS					**Target Periods: 9**
39			Classification of transducers, Selection of transducers	T1[755]	R6[6.2]
40			Resistive transducers	T1[766]	R6[6.11]
41			Capacitive transducers	T1[815]	R6[6.38]
42			Inductive transducers	T1[803]	R6[6.32]
43			Piezoelectric transducers, Hall effect transducers	T1[826,835]	R6[6.51]
44			Optical transducer	T1[840]	R6[6.59]
45			Digital transducers	T1[847]	R6[6.55]
46			Elements of data acquisition system, Smart sensors	T1[1203]	R6[7.2]
47			A/D and D/A converters	T1[933]	R6[7.17]
48			*Seminar*		
Total Periods:		**9+1 = 10**	***Test – V: Class Test-III***	***Portion :*** *Unit – V*	
49			**Content beyond Syllabus**		
50			**NPTEL: http://nptel.ac.in/courses/108106074/**		

Books: Text-(T) / Reference-(R)

S. No		Title of the Book	Author	Publisher	Year
1	T1	A Course in Electrical & Electronic Measurements & Instrumentation	Sawhney.A.K	DhanpatRai and Co, 19th Revised edition	2017
2	T2	A Course in Electronic and Electrical Measurements	J. B. Gupta	S. K. Kataria& Sons, Delhi	2003
3	T3	Measurement Systems – Application and Design	Doebelin.E.O and D.N.Manik	Special Indian Edition, Tata McGraw Hill Education Pvt. Ltd.	2007
4	R1	Electronic Instrumentation, II Edition	Kalsi.H.S	Tata McGraw Hill	2004
5	R2	Transducers and Instrumentation	Moorthy.D.V.S	Prentice Hall of India Pvt Ltd	2007
6	R3	Digital Instrumentation	Bouwens.A.J	Tata McGraw Hill	1997
7	R4	Electrical Measurements	Martin Reissland	New Age International (P) Ltd., Delhi	2001
8	R5	Principles of Measurements and Instrumentation	Alan.S.Morris	2nd edition Prentice hall of india	2003
9	*R6*	*Measurements & Instrumentation*	*U.A.Bakshi*	*Technical Publications*	*2014*
10	*R7*	*Measurements and instrumentation*	*Gnanavadivel*	*Anuradha*	*2014*

Mapping of Course Outcomes (COs) , Course (C), Program Specific Outcomes (PSOs) with Program Outcomes. (POs) – Before CBS [Levels of correlation: 3(High), 2(Medium), 1(low)]

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C214.1	2	2	-	-	-	-	-	-	-	-	-	-	1	-	-
C214.2	2	1	2	-	-	-	-	-	-	-	-	-	1	-	-
C214.3	2	2	3	2	-	-	-	-	-	-	-	-	2	-	-
C214.4	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-
C214.5	1	-	-	-	2	-	-	-	-	-	-	-	-	1	-
C214	2	1	1			-	-	-	-	-	-	-	1	-	-

Content Beyond Syllabus Added (CBS)	POs strengthened / vacant filled	CO / Unit
Automatic Process Control	PO5(2)(vacant filled)	C214.2/II

PROGRAM OUTCOMES

Electrical and Electronics Engineering Graduates will be able to:

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

Electrical and Electronics Engineering Graduates will be able to:

PSO1: Apply the fundamentals of mathematics, science and engineering knowledge to identify, formulate, design and investigate complex engineering problems of electric circuits, analog and digital electronic circuits, electrical machines and power systems.

PSO2: Apply appropriate techniques and modern Engineering hardware and software tools in power systems to engage in life- long learning and to successfully adapt in multi disciplinary environments.

PSO3: Understand the impact of Professional Engineering solutions in societal and environmental context, commit to professional ethics and communicate effectively.

PSOs	PROGRAMME OUTCOMES(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PSO1	3	3	3	3	2	1	1	1	1	1	1	1
PSO2	1	1	1	1	3	1	1	1	3	1	1	3
PSO3	1	1	2	2	1	3	3	3	2	3	2	1

Strength of correlation: 1(Weak),2(Medium),3(Strong)

STAFF INCHARGE **HOD/EEE**

K.L.N. College of Engineering

Department of Electrical and Electronics Engineering

MA6459 - NUMERICAL METHODS-[C209]

Important Questions/Tutorials/Assignments/Self study /Seminar topics.

1. Course Outcomes

	Course Outcomes-MA6459
C209.1	Determine the solution of algebraic and transcentendal system of linear equations
C209.2	To interpolate the values of unknown functions using Newton's Formula
C209.3	Estimate the numerical values of the derivatives and integrals of unknown function
C209.4	Solve first and second order initial value problem
C209.5	Solve Numerically boundary value problem

2. Mapping of Course Outcomes (COs) , Course (C), Program Specific Outcomes (PSOs) with Program Outcomes. (POs) – before CBS[Levels of correlation:3(High),2(Medium),1(low).

Course Outcomes (CO)	Program Outcome (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
C209.1	3	3	-	2	3	2	-	-	-	-	-	-	2	1	1
C209.2	3	3	-	2	3	2	-	-	-	-	-	-	2	1	1
C209.3	3	3	-	2	3	2	-	-	-	-	-	-	2	1	1
C209.4	3	3	-	2	3	2	-	-	-	-	-	-	2	1	1
C209.5	3	3	-	2	3	2	-	-	-	-	-	-	2	1	1
C209	3	3	-	2	3	2	-	-	-	-	-	-	2	1	1

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

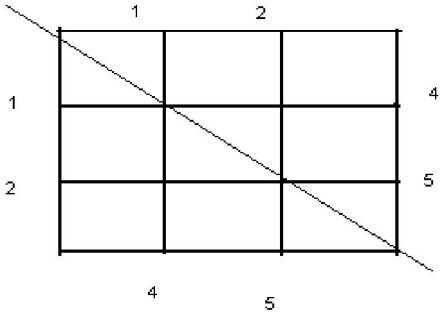
PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

S.No.	**4. Important Questions.**	COs	POs
Q.1.1.	Solve the equation$x^2 - 2x - 3 = 0$ for the positive root by iteration method	C209.1	2,3
Q.1.2.	Find the real root of the equation $cosx = 3x - 1$,using iteration method.	C209.1	2.3
Q.1.3.	Evaluate $\sqrt{12}$ to four decimal places by Newton's-Raphson Method.	C209.1	1
Q.1.4.	Find the root of $xe^x = 3$ by Regular falsi Methods to three decimal places.	C209.1	2
Q.1.5.	Solve the system of equations by Gauss-elimination method. 10x-2y+3z=23, 2x+10y-5z=-33,3x-4y+10z=41	C209.1	1,2
Q.1.6.	Using the Gauss-Jordan method solve the following equations. 10x+y+z=12, 2x+10y+z =13, x+y+5z =7.	C209.1	1,2

Q.1.7.	Solve the system of equations x+y+54z=110, 27x+6y-z=85, 6x+15y+2z=72 using Gauss-Seidel iteration method.	C209.1	1,2
Q.1.8.	Find the inverse of the matrix $\begin{bmatrix}1 & 0 & -1\\ 3 & 4 & 5\\ 0 & -6 & -7\end{bmatrix}$ using Gauss-Jordan method.	C209.1	1,2,3
Q.1.9.	Using power method to find the dominant eigen value and the eigen vector of A=$\begin{bmatrix}2 & -1 & 0\\ -1 & 2 & -1\\ 0 & -1 & 2\end{bmatrix}$	C209.1	1,2,3
Q.1.10.	Determine by power method the largest eigen value and the corresponding eigen vector of the matrix $\begin{bmatrix}1 & 3 & -1\\ 3 & 2 & 4\\ -1 & 4 & 10\end{bmatrix}$	C209.1	1,2,3
Q2.1	Write a polynomial to calculate the value of x when x: 3, 5, 7, 9 y: 6, 24, 58, 108	C209.2	2
Q2.2.	Find the divided difference table for the following: x: 1, 1, 4, 5 F(x): 8, 11, 78, 123	C209.2	2,3
Q.2.3.	Obtain the interpolation quadratic polynomial for the given data by using Newton's forward difference formula. x: 0, 2, 4, 6 y: -3, 5, 21, 45	C209.2	2,3
Q2.4.	A third degree polynomial passes through (0,1),(1,-1), (2,-1) and (3,2). Find its value at x=4.	C209.2	2,3
Q.2.5.	Using Lagrange's interpolation formula, find the value of 'x' corresponding to y=13.5 from the following table: x: 93.0, 96.2, 100.0, 104.2, 108.7 y: 11.38, 12.80, 14.70, 17.07, 19.91	C209.2	1,2
Q.2.6.	Find the cubic function from the following table. x: 0, 1, 3, 4 F(x): 1, 4, 40, 85	C209.2	1,2,3
Q2.7.	Fit the cubic spline for the data. x: 0, 1, 2, 3 F(x): 1, 2, 9, 28	C209.2	1,2,3
Q.2.8.	From the given table , the values of y are consecutive terms of a series of which 23.6 is the 6th term. Find the first and tenth term of the series. x: 3, 4, 5, 6, 7, 8, 9 y: 4.8, 8.4, 14.5, 23.6, 36.2, 52.8, 73.9	C209.2	1,2,3
Q.3.1.	For the given data x: 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6 f(x): 7.989, 8.403, 8.781, 9.129, 9.451, 9.750, 10.031 Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 1.1$	C209.3	1,2
Q.3.2.	The table given below reveals the velocity v of a body during the time 't' specified. Find its acceleration at t=1.1 x: 1.0, 1.1, 1.2, 1.3, 1.4 y: 43.1, 47.7, 52.1, 56.4, 60.8	C209.3	1,2
Q.3.3.	Compute the value of the definite integral $\int_4^{5.2} log_e x \, dx$ using Simpson's rule.	C209.3	1,2., 3

Q.3.4.	Evaluate $\int_0^2 \frac{dx}{x^2+4}$ using Romberg's method. Hence obtain an approximate value of π	C209.3	1,2., 3
Q.3.5.	Find the value of the following integral using Gaussian quadrature technique $\int_3^5 \frac{4}{2x^2}\, dx$.	C209.3	1,2
Q.3.6.	Evaluate $\int_0^1 \frac{dx}{1+x^2}$, using Gauss 3 point formula	C209.3	1,2
Q.3.7.	Evaluate the integral=$\int_1^2 \int_1^2 \frac{dxdy}{x+y}$ using the trapezoidal rule with (i)h=k=0.5, and (ii)h=k=0.25	C209.3	1,2,3
Q.4.1.	By Taylor's series method, find y(1.1) given $y' = x + y$, $y(1) = 0$.	C209.4	1,2,3
Q.4.2.	Solve $\frac{dy}{dx} = 1 - y$, y(0)=0 for x=0.1 by Euler's method.	C209.4	1,2,3 .
Q.4.3.	Using Improved Euler's method, find y(0.1) if $\frac{dy}{dx} = x^2 + y^2$, y(0)=1.	C209.4	1,2
Q.4.4.	Runge-Kutta method to approximate y, when x=0.1,0.2,0.3, h=0.1 given x=0 when y=1 and $\frac{dy}{dx} = x + y$	C209.4	1,2,3 .
Q.4.5.	Using Runge-Kutta of fourth order solve $\frac{dy}{dx} = \frac{y^2-x^2}{y^2+x^2}$ with y(0)=1 at x=0.2, 0.4.	C209.4	1,2,3
Q.4.6.	The differential equation $\frac{dy}{dx} = y - x^2$ is satisfied by y(0)=1, y(0.2)=1.12186, y(0.4)=1.46820, y(0.6)=1.7379. Compute the value of y(0.8) by Milne's Predictor-Corrector formula	C209.4	2,3
Q4.7	Using Adam's method find y(0.4) given $y' = \frac{xy}{2}$. y(0)=1, y(0.1)=1.01, y(0.2)=1.022, y(0.3)=1.023.	C209.4	2,3
Q.5.1.	Solve the differential equation $\frac{d^2y}{dx^2}$ -y =x with y(0)=0, y(1)=0 with h=$\frac{1}{4}$	C209.5	1.
Q5.2.	Solve the equation$\frac{\partial u}{\partial t} = \frac{1}{2}\frac{\partial^2 u}{\partial t^2}$, $0 \le x \le 12$,$0 \le t \le 12$ with boundary and initial conditions u(x,0)=$\frac{x(15-x)}{4}$ $0 \le x \le 12, u(0,t) = 0, u(12,t) = 9, 0 \le t \le 12$. Using Schmidt relation.	C209.5	1,2,3 .
Q.5.3.	Solve $U_{tt} = 4U_{xx}$ with boundary conditions u(0,t)=0=u(4,t) , $u_t(x,0) = 0$ *and* u(x,0)=x(4-x).	C209.5	1,2,3
Q.5.4.	Solve $u_{xx} + u_{yy} = 0$ in $0 \le x \le 4, 0 \le y \le 4$. Given that u(0,y)=0,u(4,y)=8+2y, u(x,0)=$\frac{x^2}{2}$ and u(x,4)=2 taking h=k=1. Obtain the result correct to one decimal.	C209.5	1,2,3
Q.5.5.	Using Leibmann's method, solve the equation $u_{xx} + u_{yy} = 0$ for the following square mesh with boundary values as shown in the figure. Iterate until the maximum difference between successive values at any point is less than 0.001 	C209.5	1,2,3
5.Assignments/Seminar/Self study topics.			
A.1.1.	**Find an iterative formula to find $\sqrt{N}$,where N is a positive number and hence find $\sqrt{5}$**	C209.1	1
A.1.2.	**Solve for a positive root of the equation $x^4 - x - 1 = 0$ using Newton**	C209.1	2,3

	_Raphson method		
A.1.3.	**Solve $y = 3e^x - 3x = 0$ by the method of fixed point iteration.**	C209.1	2,3
A.1.4.	**Solve the system of equation by Gauss-Jordan method $5x_1 - x_2 = 9$, $-x_1 + 5x_2 - x_3 = 4$, $-x_2 + 5x_3 = -6$.**	C209.1	1,2
A.1.5.	**Apply Gauss-Elimination method to find the solution of the following system $2x + 3y - z = 5$, $4x + 4y - 3z = 3$, $2x - 3y + 2z = 2$.**	C209.1	1,2
A.1.6.	**Using Gauss-Jordan method, find A^{-1} if $A = \begin{bmatrix} 1 & 2 & 6 \\ 2 & 5 & 15 \\ 6 & 15 & 46 \end{bmatrix}$**	C209.1	1,2,3
A.1.7	**Determine the largest eigen value of the matrix using power method given $A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$**	C209.1	1,2,3
A.1.8	**Using Gauss-Seidel method, to solve the following system of linear equation $4x + 2y + z = 14$, $x + 5y - z = 10$, $x + y + 8z = 20$.**	C209.1	1,2
A.2.1	**Find the polynomial f(x) by using Lagrange's formula and hence find f(3) for the following values of x and y.** X: 0, 1, 2, 5 Y: 2, 3, 12, 147	C209.2	2,3
A.2.2.	**Determine f(x) as a polynomial in x for the following data, using Newton's Divided Difference formula. Also find f(2).** X: -4, -1, 0, 2, 5 F(x): 1245, 33, 5, 9, 1335	C209.2	2,3
A.2.3.	**By using Newton's Divided difference formula find the function** X: 0, 1, 2, 4, 5, 7 F(x): 0, 0, -12, 0, 600, 7308	C209.2	2,3
A.2.4.	**Find the cubical polynomial which takes the following values** X: 0, 1, 2, 3 Y: 1, 2, 1, 10	C209.2	1,2,3
A.2.5.	**The population of a town is as follows** X (in Year): 1941, 1951, 1961, 1971, 1981, 1991 Y (Population in 1000): 20, 24, 29, 36, 46, 51 **Estimate the population increase during the period 1946 to 1976.**	C209.2	1,2,3
A.2.6.	**Given the following table, find the number of students whose weight is between 60 and 70 lbs.** Weight X (lbs): 0-40, 40-60, 60-80, 80-100, 100-120 No. of students: 250, 120, 100, 70, 50	C209.2	1,2,3
A.2.7.	**Find the cubic Spline for the following data** X: 1, 2, 3, 4, 5 Y: 1, 0, 1, 0, 1	C209.2	1,2,3
A.2.8	**If f(0)=1, f(1)=2, f(2)=33 and f(3)=244. Find a cubic Spline approximately**	C209.2	2,3

	assuming M(0)=M(3)=0. Also, find f(2.5).		
A.3.1.	Find the first three derivative of f(x) at x=1.5 by Newton's Forward Interpolation formula to the data given below. X: 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 Y: 3.375 | 7 | 13.625 | 24.0 | 38.875 | 59	C209.3	1,2,3
A.3.2.	The velocities of a car running on a straight road at intervals of 2 minutes are given below. Time (in Minutes): 0 | 2 | 4 | 6 | 8 | 10 | 12 Velocity (in Km/Hr.): 0 | 22 | 30 | 27 | 18 | 7 | 0 Using Simpson's 1/3 rd rule, find the distance covered by the car	C209.3	1,2,3
A.3.3.	Taking h=0.05, evaluate $\int_1^{1.3} \sqrt{x}\, dx$ using Trapezoidal and Simpson's 1/3 rd rule	C209.3	1,2,3
A.3.4.	Using Romberg's integration to evaluate $\int_0^1 \frac{dx}{1+x^2}$	C209.3	1,2,3
A.3.5.	Apply three point Gaussian Quadrature formula to evaluate $\int_0^1 \frac{sinx}{x}\, dx.$	C209.3	1,2,3
A.3.6	Evaluate $\int_0^6 dx/(1+x)$ using Trapezoidal rule and check by direct integration.	C209.3	1,2
A.3.7	The population of a certain town is given below.Find the rate of a growth of the population is 1931. Year x: 1931 | 1941 | 1951 | 1961 | 1971 Population in thousands y: 40.62 | 60.80 | 79.95 | 103.56 | 132.65	C209.3	2,3
A.3.8	Using Gaussian three point formula, evaluate $\int_{-1}^{1}(3x^2+5x^4)dx$	C209.3	1,2,3
A.4.1.	Given y'=-y and y(0)=1, determine the values of y at x=0.001, 0.02, 0.03 by Euler method.	C209.4	1,2
A.4.2.	Find y(0.4) given $\frac{dx}{dy}=\frac{xy}{2}$, y(0) =1, y(0.1) =1.01, Y(0.2) = 1.022, y(0.3) = 1.023 by Adam's method.	C209.4	2,3
A.4.3.	Using Runge-kutta method of fourth order, find y(0,7) correct to 3 decimal places if $y'=y-x^2$,y(0.6)=1.7379.	C209.4	1,2,3
A.4.4.	Using Taylor series method, find y(1.1) correct to four decimal places given $\frac{dy}{dx} = xy^{1/3}$ and y(1) =1.	C209.4	1,2
A.5.1.	1. Solve upto 2 decimals $u_{xx}+u_{yy}= 0$ over the square mesh of side 4 units satisfying the following boundary conditions. i) u (0,y)=0 ,for $0 \le y \le 4$ ii.) u (4,y)=12+y for $0 \le y \le 4$ iii.)u(x,0) = 3x for $0 \le y \le 4$ iv.) $u(x,4)=x^2$ for $0 \le y \le 4$	C209.5	1,2,3
A.5.2.	Using Crank – Nicholson's implicit scheme,solve the heat equation uxx=ut,t≥0 , 0≤x≤1 subject to the conditions u(x,0)=0 ,u(0,t) =0 u(1,t) =t for two time steps	C209.5	1,2,3
A.5.3	Solve the Poission Equation $\nabla^2 u = -10 (x^2 + y^2 + 10)$ over the square with sides x=0, y = 0, x=3,y=3 with u = 0 on the boundary taking h = 1.	C209.5	1,2,3
A.5.4	Use Crank – Nicholson's scheme to solve $\frac{\partial^2 u}{\partial x^2} = 16\frac{\partial u}{\partial t}$, 0 < x < 1 and t > 0 given u(x, 0) = 0, u(0, t)=0and u(1, t) = 100t. Compute u(x, t) for one time step taking Δx = $\frac{1}{4}$	C209.5	1,2,3

A.5.5	Solve y'' – y = x, x∈ (0, 1) given y(0)= y(1) = 0 using finite differences dividing the interval into 4 equal parts.	C209.5	1,2,3
	6.Tutorial		
T.1.1.	Solve the system of equations x+y+54z=110, 27x+6y-z=85, 6x+15y+2z=72 using Gauss-Seidel iteration method	C209.1	1,2,
T.1.2.	Determine by power method the largest eigen value and the corresponding eigen vector of the matrix $\begin{bmatrix} 1 & 3 & -1 \\ 3 & 2 & 4 \\ -1 & 4 & 10 \end{bmatrix}$	C209.1	1,2,3
T.1.3.	Using the Gauss-Jordan method solve the following equations. 10x+y+z=12, 2x+10y+z =13, x+y+5z =7.	C209.1	1,2
T.2.1.	Using Lagrange's interpolation formula, find the value of 'x' corresponding to y=13.5 from the following table: x: 93.0, 96.2, 100.0, 104.2, 108.7 y: 11.38, 12.80, 14.70, 17.07, 19.91	C209.2	1,2
T.2.2.	From the given table , the values of y are consecutive terms of a series of which 23.6 is the 6th term. Find the first and tenth term of the series. x: 3, 4, 5, 6, 7, 8, 9 y: 4.8, 8.4, 14.5, 23.6, 36.2, 52.8, 73.9	C209.2	1,2,3
T.2.3	Find the cubic function from the following table. x: 0, 1, 3, 4 F(x): 1, 4, 40, 85	C209.2	1,2,3
T.3.1.	The table given below reveals the velocity v of a body during the time 't' specified. Find its acceleration at t=1.1 x: 1.0, 1.1, 1.2, 1.3, 1.4 y: 43.1, 47.7, 52.1, 56.4, 60.8	C209.3	1,2,3
T.3.2	Evaluate $\int_0^2 \frac{dx}{x^2+4}$ using Romberg's method. Hence obtain an approximate value of π	C209.3	1,2
T.3.3	Evaluate the integral=$\int_1^2 \int_1^2 \frac{dxdy}{x+y}$ using the trapezoidal rule with (i)h=k=0.5, and (ii)h=k=0.25	C209.3	1,2
T.4.1	Runge-Kutta method to approximate y, when x=0.1,0.2,0.3, h=0.1 given x=0 when y=1 and $\frac{dy}{dx} = x + y$	C209.4	1,2,3
T.4.2	Using Improved Euler's method, find y(0.1) if $\frac{dy}{dx} = x^2 + y^2$, y(0)=1.	C209.4	1,2
T.4.3	Using Adam's method find y(0.4) given $y' = \frac{xy}{2}$. y(0)=1, y(0.1)=1.01, y(0.2)=1.022, y(0.3)=1.023	C209.4	2,3
T.5.1	Solve the differential equation $\frac{d^2y}{dx^2}$ -y =x with y(0)=0, y(1)=0 with h=$\frac{1}{4}$	C209.5	1,2,3
T.5.2	Solve the equation$\frac{\partial u}{\partial t} = \frac{1}{2}\frac{\partial^2 u}{\partial t^2}$, $0 \le x \le 12$,$0 \le t \le 12$ with boundary and initial conditions u(x,0)=$\frac{x(15-x)}{4}$ $0 \le x \le 12, u(0,t) = 0, u(12,t) = 9, 0 \le t \le 12$. Using Schmidt relation.	C209.5	1,2,3
T.5.3	Solve $u_{xx} + u_{yy} = 0$ in $0 \le x \le 4, 0 \le y \le 4$. Given that u(0,y)=0,u(4,y)=8+2y, u(x,0)=$\frac{x^2}{2}$ and u(x,4)=2 taking h=k=1. Obtain the result correct to one decimal.	C209.5	1,2,3

K.L.N. College of Engineering
Department of Electrical and Electronics Engineering
EE6401- Electrical Machines-I [C210]
Important Questions /Tutorials /Assignments /Self study /Seminar topics.

1. Course outcomes

Course	Course outcomes	POs
C210.1	Describe the coupled coil calculate the self and mutually induced emf	1,2,5
C210.2	Analyze the operation of transformer in different loading condition	1,2,4,5
C210.3	Explain the concept of field energy and co-energy in single and multiple excited systems	1,2,5
C210.4	Demonstrate the construction of D.C machines and operation of DC Generator	1,2,5
C210.5	Derive the performance equation of D.C motor under various load condition and analyze the braking system	1,2,4,5

2. Mapping of Course Outcomes (COs) , Course (C), Program Specific Outcomes (PSOs) with Program Outcomes (POs) – before CBS [Levels of correlation:3(High),2(Medium),1(low).

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C210.1	3	2	-	-	1	-	-	-	-	-	-	-	1	-	-
C210.2	3	2	-	2	1	-	-	-	-	-	-	-	2	-	-
C210.3	3	2	-	-	1	-	-	-	-	-	-	-	1	-	-
C210.4	3	2	-	-	1	-	-	-	-	-	-	-	1	-	-
C210.5	3	2	-	2	1	-	-	-	-	-	-	-	2	-	-
C210	3	2	-	1	1	-	-	-	-	-	-	-	1	-	-

3. PROGRAM OUTCOMES (POs)

Electrical and Electronics Engineering Graduates will be able to:

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO4: Conduct investigations of complex problems:
Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

Sl.No.	**4. Important Questions.**	COs	POs
Q.1.1.	Classify the various types of material based on relative permeability μ_r	C210.1	1
Q.1.2.	Describe the various types of induced emf and compare these induced emfs	C210.1	1,2
Q.1.3.	Explain the various core loss occurs in magnetic circuits	C210.1	1
Q.1.4.	Compare the self and mutual inductance and induced emf in a coupled coils	C210.1	1,2
Q.1.5.	Explain the ac operation of magnetic circuits	C210.1	1
Q.1.6.	A coil 1500 turns carrying a current of 5 Amps produces a flux of .5 m Wb. Find the self inductance of the coil	C210.1	1,2
Q.1.7.	Derive the necessary expression to separate core loss components based on frequency variation	C210.1	1,2
Q.2.1.	Compare the core and shell type transformers	C210.2	1
Q2.2.	Describe the construction and principle of operation of single phase transformer	C210.2	1,2
Q.2.3.	Derive the expression for maximum efficiency of transformer and find current at maximum efficiency	C210.2	1,2
Q.2.4.	Explain how the efficiency of a single phase transformer is estimated from the open circuit and short circuit test	C210.2	1,2
Q.2.5.	Derive the expression for copper saving in auto transformer while comparing with a two winding transformer	C210.2	1,2

Q.3.1.	Consider an attracted armature relay is exited by an electric source. Explain about themechanical force developed and the mechanical energy output with necessary equations	C210.3	1,2
Q.3.2.	Derive the expression for peak value of the fundamental mmf space wave of single phase distributed winding	C210.31 ,2	1,2
Q.3.3.	Derive the expression for torque in a singly excited system	C210.3	1,2
Q.3.4.	Derive the expression for field energy and co energy in a doubly excited system assuming constant voltage system	C210.3	1,2
Q.3.5.	Derive the expression for torque in rotating machine and list out what are the assumptions to be made.	C210.3	1,2
Q.4.1.	Draw the internal and External Characteristics of D.C.Series generator	C210.4	
Q.4.2.	Derive the EMF equation of wave wound DC generator	C210.4	1,2
Q.4.3.	Explain the process of commutation in a DC machine	C210.4	1
Q.4.4.	Define armature reaction in a DC shunt generator	C210.4	1
Q.4.5.	What are the conditions to be satisfied before connecting two DC generators in parallel	C210.4	1
Q.5.1.	Why starting current of DC motors is higher than rated current	C210.5	1
Q.5.2.	Explain the operation of three point starter with a neat sketch	C210.5	1,2
Q.5.3.	Compare different method of speed control in DC motors	C210.5	1
Q.5.4.	Explain the Hopkinson's test for determining efficiency of two similar DC shunt machines	C210.5	1,2
Q.5.5.	Derive the expression to predetermine the constant loss and efficiency by Swinburne's test method.	C210.5	1,2
T.1.1.	A wire of length 80cm moves at right angles to its length at 30 m/s in a uniform field of flux density 1.2 wb/m^2. Calculate the electromotive force induced in the conductor when the direction of motion is inclined at 45^0 to the direction of field	C210.1	1,2
T.1.2.	A coil consisting of 120 turns is placed in the magnetic field of 0.8 mwb. Calculate the averageemf induced in the coil when it is moved in 0.08 sec from the given field to the field of 0.3 mwb. If the resistance of the coil is 200 ohm, find the induced current in the coil	C210.1	1,2
T.1.3.	An iron core has a mean length of 80cm and cross sectional area of 10cm^2 the value of permeability is 1000 and ring is wound with 5000 turns. it is required to produce a flux of 30 m wb in the ring than calculate i) reluctance of the ring ii) flux density iii) current in the coil.	C210.1	1,2
T.1.4.	The core–loss (hysteresis -eddy-current loss)for a give specimen of magnetic material is found to be 2000 W at 50Hz .Keeping the flux density constant ,the frequency of the supply is raised to 75 Hz resulting in a core of 3200 W .Compute separately hysteresis and eddy current losses at both the frequencies	C210.1	1,2
T.1.5.	A ring composed of three sections. The cross section area is 0.001m2 for each section. The mean arc length are l_a = 0.3 m, l_b,= 0.2m, l_c =0.1 m. an air gap length of 0.1 mm is cut in the ring. $\mu r$for sections a,, b and c are 5000, 1000 and 10000 respectively. Flux in the air gap is 7.5 × 10–4 Wb. Find (i) mmf (ii) exciting current if the coil has 100turns (iii) reluctance of the sections	C210.1	1,2
T.2.1.	A 40KVA transformer has iron loss of 450 W and full load copper loss of 850W.If the power factor of the load is 0.8 lagging, calculate (i) full load efficiency (ii) the load at which maximum efficiency occurs(iii)the maximum efficiency	C210.2	1,2
T.2.2.	A 120kVA, 6000/400V, Y/Y, 3-phase, 50Hz transformer has a iron loss of 1800W.The maximum efficiency occurs at ¾ full loads. Find the efficiency of the transformer At (i) full load and 0.8 pf (iii) the maximum efficiency at unity pf	C210.2	1,2
T.2.3.	Obtain equivalent circuit of a 200/400V,50Hz,1-phase transformer from the following test data: O.C.test:200 v,0.7A,70W-on L.V side; S.C.test:15V,10A,85W-on H.V.side. Calculate the secondary voltage when delivering 5 kW at 0.8pf lagging the primary voltage being 200V.II) Explain the various types of 3-phase transformer connection in detail	C210.2	1,2
T.2.4.	A 200 kVA distribution transformer has core loss of 2000 watts and full load copper loss of 3000watts.In a day it is loaded as follows: 8 hours-200 kVA at UPF 4 hours -150 kVA at 0.6 pf lag 4 hours – 100 kVA at 0.8 pf lag.	C210.2	1,2

	Find the all day efficiency		
T.2.5.	A 500KVA transformer has 95%efficiency at full load and also at 60% of full load both at UPF.a)Separate out the transformer losses.b) Determine the transformer efficiency at 75%full load, UPF.=0.387+j0.29. Solve the exact equivalent circuit across the prim	C210.2	1,2
T.3.1.	The field winding of dc electromagnets is wound with 800 turns and has a resistance of 40Ω when exciting voltage is 230 volt; magnetic flux around the coil is 0.04 Wb. Calculate self-inductance and energy stored in magnetic field	C210.3	1,2
T.3.2.	Two coupled coils have self and mutual inductance of L11 = 3+0.5 x ; L22 = 2+0.5x ; L12= L21=0.3x Over a certain range of linear displacement x. The first coil is excited by a constant current of 15A and the second by a constant current of -8A.(i)Mechanical work done if x changes from 0.6 to1m.(ii)Energy supplied by each electrical source in part 1	C210.3	1,2
T.3.3.	In the electromagnetic relay , L11 = k1/x, L22 = k2/x, L12 = k3/x Find the expression for the force on the armature, if i1 = I1 sin w1t, i2 = I2 sin w2twrite an expression for the average force. For what relationship between w1 and w2, the average force is (i) maximum (ii) minimum.	C210.3	1,2
T.4.1.	A 400V DC shunt generator has a full load current of 200 A. The resistance of the armature and field windings are 0.06 Ω and 100 Ω respectively. The stray losses are 2000 W.Find the Kw output of prime mover when it is delivering full load and find the load for which the efficiency of the generator is maximum	C210.4	1,2
T.4.2.	Two DC shunt generators are connected in parallel to supply a load of 5000 A. Each machine has an armature resistance of 0.03 Ω and field resistance of 60 Ω but the emf of one machine is 600V and that of the other machine is 640 V. What power does each machine supply?	C210.4	1,2
T.4.3.	A 100 kW DC hunt generator driven by a belt from an engine runs at 750 rpm and is connected to 230 V dc mains. When the belt breaks, it continues to run as a motor drawing 9kW from the mains. At what speed would it run? Given: Armature resistance= 0.018 Ω and field resistance=115Ω	C210.4	1,2
T.4.4.	In a 110 V compound generator, the resistance of the armature, shunt and series windings are 0.06, 25 and 0.05 W respectively, The load consists of 200 lamps each rated at 55 W,100 V. Find the emf and armature current, when the machine is connected for (a) long shunt (b) short shunt (c) How will the ampere turns of the series windings be changed, if in (a) a diverter of resistance 0.1 W is connected across the series field? Ignore armature reaction and brush voltage drop	C210.4	1,2
T.4.5.	Hopkinson's test on two machines gave the following results for full load; line voltage 230 V, line current excluding field current 50 A; motor armature current 380 A; field currents 5 and 4.2 A. Calculate the efficiency of each machine. The armature resistance of each machine = 0.02 W. State the assumptions made.	C210.4	1,2
T.5.1.	A 500V dc shunt motor running at 700 rpm takes an armature current of 50A.Its effective armature resistance is 0.4Ω. What resistance must be placed in series with the armature to reduce the speed to 600 rpm, the torque remaining constant?	C210.5	1,2
T.5.2.	A DC series motor runs at 500 rpm on 220 V supply drawing a current of 50 A. The total resistance of the machine is 0.15Ω, Calculate the value of the extra resistance to be connected in series with the motor circuit that will reduce the speed to 300 rpm. The load torque being then half of the previous to the current.	C210.5	1,2
T.5.3.	A 250 V dc shunt motor runs at 1000 rpm on no load and takes 5A.The armature and shunt field resistance are 0.2Ω and 250Ω respectively. Calculate the speed when loaded and taking a current of 50A.Due to armature reaction the field weakens by 3%	C210.5	1,2
T.5.4.	A 250V DC shunt motor has R_f=150Ω and R_a=0.6Ω.The motor operates on no-load with a full field flux at its base speed of 1000 rpm with Ia=50A.If the machine drives a load requiring a torque of 100 Nm, Calculate armature current and speed of motor. If the motor is required to develop 12 kW at 1200 rpm. What is the required value of the external series resistance in the field circuit? Assume linear magnetization. Neglect saturation and armature reaction	C210.5	1,2
T.5.5.	A dc shunt motor is being operated from 300 V mains. Its no-load speed is 1200 rpm. When fully loaded, it delivers a torque of 400 Nm and its speed drops to 1100 rpm. Find its speed and power output when delivering the same torque; if operated with an armature voltage of 600 V. Excitation is assumed unchanged, i.e. the motor field is still	C210.5	1,2

	excited at 300 V. State any assumption you are required to make		
	6. Assignments/Seminar/Self study topics.		
A.1.1.	In a magnetic circuit made of mild steel, the central limb is wound with 500 turns and has a cross-sectional area of 800 mm^2. Each of the outer limbs has a cross-sectional area of 500 mm^2. The air-gap has a length of 1 mm. Calculate the current required to set up a flux of 1.3 m Wb in the central limb assuming no magnetic leakage and fringing. Mild steel required 3800 AT/m to produce flux density of 1.625 T and 850 AT/m to produce flux density of 1.3 T	C210.1	1,2, 4
A.1.2.	An iron rod 1.8 cm diameter is bent to form a ring of mean diameter 25cm and wound with 250 turns of wire. A gap of 1mm exists in between the end faces. Calculate the current required to produce a flux of 0.6mWb. Take relative permeability of iron as 1200	C210.1	1,2
A.1.3.	Two coils A and B are wound on same iron core. There are 600 turns on A, and 3600 turns on B. The current of 4 Amps flows through the coil and produces a flux of $500x10^{-6}$Wb in the core. If this current is reversed in 0.02 second .Calculate average emf induced in coils A and	C210.1	1,2
S.S.1.1	Write a matlab code to find self and mutual inductance of coupled colis	C210.1	5
A.1.4	A steel ring has a mean diameter of 20 cm, a cross section of 25 cm^2 and a radial air-gap of 0.8 mm cut across it. When excited by a current of 1A through a coil of 1000 turns wound on the ring core, it produces an air-gap flux on 1 mWb. Neglecting leakage and fringing. Calculate(i) relative permeability of steel (ii)total reluctance of the magnetic circuit	C210.1	1,2
A.2.1.	The O.C and S.C tests on a 5kVA, 230/110V, and 50Hz transformer gave the following Data: O.C test (h.v side):230V, 0.6A, 80W, S.C test (l.v side):6V, 15A, 20W. Calculate the percentage efficiency and the regulation of the transformer on full load at 0.8 p.f lagging	C210.2	1,2
A.2.2.	A 200 kVA distribution transformer has core loss of 2000 watts and full load copper loss of 3000watts.In a day it is loaded as follows: 8 hours-200 kVA at UPF 4 hours -150 kVA at 0.6 pf lag 4 hours – 100 kVA at 0.8 pf lag. Find the all day efficiency	C210.2	1,2
A.2.3.	The maximum efficiency of a single phase 250kVA, 2000/250 V transformer occurs at 80% of full load and is equal to 97.5% at 0.8 pf .Determine the efficiency and regulation on full load at 0.8pf lagging if the impedance of the transformer is 9 %	C210.2	1,2
A.2.4.	A 50KVA ,4400/220V transformer has R1=3.45 ΩR2=0.009 Ω. The values of the reactance are x1=5.2 Ω and x2=0.015 Ω. Calculate equivalent resistance as referred to primary, equivalent resistance as referred to secondary, equivalent reactance referred to both primary and secondary, equivalent impedance referred to both primary and secondary, total cu loss first using individual resistances of the two windings and secondly using equivalent resistances as referred to each side load	C210.2	1,2
S.S.2.1	Write a matlab code to find Equivalent circuit parameters from O.C and S.C test data	C210.2	4,5
A.3.1.	Two coupled coils have self and mutual inductance of L11=2+1/(2x); L22=1+1/(2x): L12= L21=1/(2x). Over a certain range of linear displacement x. The first coil is excited by a constant current of 20A and the second by a constant current of -10A. 2000 Mechanical work done if x changes from 0.5to1m (ii) Energy supplied by each electrical source Hence verify that the energy supplied by the sources is equal to the increase in Field energy plus the mechanical work done	C210.3	1,2
A.3.2.	The self and mutual inductance of a double exited system is L11=4+cos2θ, L12=L21=0.15cosθ. L22=2+5cos2θ.Find the torque developed in it.	C210.3	1,2
A.3.3.	Two coils have a self and mutual inductances of L11 = L22 = 2 / (1+2x) and L12= 2 / (1+2x) calculate the time average force and coil current at x-0.5m if. 1. Both are connected in parallel across cos314t voltage source. 2. Both are connected in series across the same voltage source of 100cos314t V. 3. Coil 1 is connected across the voltage source of 100cos314t and coil 2 is shorted	C210.3	1,2
S.S.3.1	Write a matlab code to find Mechanical work done in double excited system	C210.3	5
A.4.1.	A 100 Kw DC hunt generator driven by a belt from an engine runs at 750 rpm and is connected to 230 V dc mains. When the belt breaks, it continues to run as a motor	C210.4	1,2

	drawing 9Kw from the mains. At what speed would it run? Given: Armature resistance= 0.018 Ω and field resistance=115Ω		
A.4.2.	In a 110 V compound generator, the resistance of the armature, shunt and series windings are 0.06, 25 and 0.05 W respectively, The load consists of 200 lamps each rated at 55 W,100 V. Find the emf and armature current, when the machine is connected for (a) long shunt (b) short shunt (c) How will the ampere turns of the series windings be changed, if in (a) a diverter of resistance 0.1 W is connected across the series field? Ignore armature reaction and brush voltage drop	C210.4	1,2
A.4.3.	A 400V DC shunt generator has a full load current of 200 A. The resistance of the armature and field windings are 0.06 Ω and 100 Ω respectively. The stray losses are 2000 W.Find the Kw output of prime mover when it is delivering full load and find the load for which the efficiency of the generator is maximum	C210.4	1,2
SE.4.1	Analysis for Minimising armature reaction effects in dc generator and improving commutation	C210.4	5
A.5.1.	A 50 kW, 230 V dc shunt motor has an armature resistance of 0.1 W and a field resistance of 200 W. It runs on no-load at a speed of 1400 rpm, drawing a current of 10 A from the mains.When delivering a certain load, the motor draws a current of 200 A from the mains.Find the speed at which it will run at this load and the torque developed. Assume that the armature reaction causes a reduction in the flux/pole of 4% of its no-load value.	C210.5	1,2
A.5.2.	A 200 V shunt motor takes 10 A when running on no-load. At higher loads the brush drop is 2 V and at light loads it is negligible. The strayload loss at a line current of 100 A is 50% of the no-load loss. Calculate the efficiency at a line current of 100 A if armature and field resistances are 0.2 and 100 W respectively	C210.5	1,2
A.5.3.	A 250V DC shunt motor has R_f=150Ω and R_a=0.6Ω.The motor operates on no-load with a full field flux at its base speed of 1000 rpm with Ia=50A.If the machine drives a load requiring a torque of 100 Nm, Calculate armature current and speed of motor. If the motor is required to develop 12 kW at 1200 rpm. What is the required value of the external series resistance in the field circuit? Assume linear magnetization. Neglect saturation and armature reaction	C210.5	1,2
SE.5.1	Analysis of different methods of speed control and braking using solid state devices	C210.5	4,5

K.L.N. College of Engineering

Department of Electrical and Electronics Engineering

CS 6456 - OBJECT ORIENTED PROGRAMMING [C211]

Important Questions/Assignments/Self study /Seminar topics.

1.Course outcomes

Course	Course outcomes	POs
C211.1	Explain the key attributes of C++ like native types and statements and implement ADT.	1
C211.2	Develop object oriented programs using polymorphism and data abstraction concepts.	2
C211.3	Design templates, construct generics and to handle exceptions.	3
C211.4	Develop the concept of java in creating classes, objects using arrays and control statements.	4
C211.5	Create packages, handle exceptions and develop multi-threaded programs.	5

2. Mapping of Course Outcomes (COs) , Course (C), Program Specific Outcomes (PSOs) with

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C211.1	2	-	-	-	-	-	-	-	-	-	-	-	1	-	-
C211.2	2	1	2	3	2	-	-	-	-	-	-	-	2	1	-
C211.3	2	1	2	3	2	-	-	-	-	-	-	-	2	1	-
C211.4	2	1	2	3	2	-	-	-	-	-	-	-	2	1	-
C211.5	2	1	2	3	2	-	-	-	-	-	-	-	2	1	-
C211	2	1	2	2	2	-	-	-	-	-	-	-	2	1	-

Program Outcomes. (POs) – before CBS[Levels of correlation:3(High),2(Medium),1(low).

3. PROGRAM OUTCOMES (POs)

Electrical and Electronics Engineering Graduates will be able to:

PO1: Engineering knowledge:

Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis:

Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions:

Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage:

Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

S.No.	4. Important Questions.	COs	POs
Q.1.1.	What is object oriented programming? How is it different from structured programming? Explain the features of OOPS.	C211.1	2
Q.1.2.	Explain about inline function?	C211.1	2
Q.1.3.	What are the needs of object oriented paradigm.	C211.1	2
Q.1.4.	Explain the use of constant pointers and pointers to constant with an	C211.1	2

	example.		
Q.1.5.	Write a C++ program for loop control statements and explain the same .	C211.1	2
Q.2.1.	Explain the constructors and destructors in detail with example program	C211.2	2,3,4
Q2.2.	Explain friend function with example.	C211.2	3
Q.2.3.	Explain operator overloading and function overloading supporting compile time polymorphism with suitable program.	C211.2	3
Q2.4.	Explain copy constructor with suitable example.	C211.2	2
Q.2.5.	Construct a C++ program for friend function with two class names also list out the characteristics of friend function.	C211.2	3,4,5
Q.3.1.	Explain the types of inheritance with an example program.	C211.3	2
Q.3.2.	Construct a template function to sort an array by bubble sort.	C211.3	3,4
Q.3.3.	Explain the components of Standard Template Library (STL) in detail.	C211.3	2
Q.3.4.	Explain IO streams used for file operation.	C211.3	2,5
Q.3.5.	Write a C++ program to generate user defined exception whenever user inputs odd numbers and also explain function templates with an example.	C211.3	2,3,4
Q.4.1.	Write short notes on the following in Java. (a) String (b) Java virtual machines	C211.4	2
Q.4.2.	Explain method overriding with suitable example.	C211.4	2,3
Q.4.3.	Write a Java program for alphabetical ordering of strings.	C211.4	3,4,5
Q.4.4.	Write a JAVA program to create two single dimensional arrays, initialize them and add them; store the result in another array.	C211.4	1,3,4
Q.4.5.	Explain about Inheritance in Java with suitable example program	C211.4	2,3
Q.5.1.	Write a Java program to implement nested packages.	C211.5	3,4
Q5.2.	Explain about Thread lifecycle?	C211.5	2
Q.5.3.	Write a Java program to throw user defined exceptions.	C211.5	2
Q.5.4.	Write a JAVA program to get and display the details of staff name and designation in a class, department, salary in another class and awards in the third class using interfaces and Inheritance	C211.5	1,3,4,5
Q.5.5.	Explain the streams and IO and java threads in Java with suitable examples.	C211.5	5
	6.Assignments/Seminar/Self study topics.		
A.1.1.	Develop a program to check whether the given number is positive or negative (using ? : ternary operator)	C211.1	2
A.1.2.	Generate a source code to calculate the sum of following series where n is input by user. 1 + 1/2 + 1/3 + 1/4 + 1/5 +……1/n	C211.1	2
A.1.3.	Create a program to print out all Armstrong numbers between 1 and 500. If sum of cubes of each digit of the number is equal to the number itself, then the number is called an Armstrong number. For example, 153 = (1 * 1 * 1) + (5 * 5 * 5) + (3 * 3 * 3)	C211.1	2
A.1.4.	Write a program to enter the numbers till the user wants and at the end it should display the maximum and minimum number entered.	C211.1	2
A.1.5.	Develop a program in C++ to calculate HCF of Two given number.	C211.1	2
A.3.1	Explain the definition for a class called time that has hours and minutes as integer. The class has the following member functions: void settime(int, int) to set the specified value in object void showtime() to display time object time sum(time) to sum two time object & return time 1. Write the definitions for each of the above member functions. 2. Write main function to create three time objects. Set the value in two objects and call sum() to calculate sum and assign it in third object. Display all time objects.	C211.2	2,3,4
A.3.2	Illustrate the concept of single inheritance to find out the payroll system using C++	C211.3	3,4,5
A.3.3	Create an abstract class Counter. It should have only pure virtual functions.	C211.3	3,4,5

	It should have a method click() that would advance the counter. It should have methods get() and set() for accessing and mutating the counter's value.		
A.4.1.	Develop a Java program to make such a pattern like right angle triangle with number increased by 1 2 3 4 5 6 7 8 9 10	C211.4	2,3,4,5
A.4.2.	Generate a source code in Java to print the Floyd's Triangle 1 01 101 0101 10101	C211.4	4,5
A.4.3.	Create a program called SumAndAverage to produce the sum of 1, 2, 3, ..., to 100. Also compute and display the average.	C211.4	4,5
Seminar			
1.	Java Programming GUI with AWT	C211.5	1,2,9,10
2	AWT Event Handling		
3.	AWT - Creating Your Own Event, Source and Listener		
4.	Java – Inner classes		
5.	Layout Managers and panel – flow layout		
6.	Layout Managers and panel – grid layout		
7.	Layout Managers and panel – Border layout		
8.	Layout Managers and panel – Box layout		
9.	Swing – Introduction and features		
10.	Swing – ImageIcon		
11.	Swing - Setting the Appearances and Properties of JComponents		
12.	Swing - Positioning Your Application Window		
13.	Swing - Text Components: JTextField, JTextArea, JEditorPane		
14.	Swing - Buttons and ComboBox: JButton, JCheckBox, JRadioButton, JComboBox		
15.	Swing - Menu-Bar: JMenuBar, JMenu, JMenuItem		
16.	Swing - JOptionPane: Interacting with the User		
17.	Pluggable Look and Feel – Setting the look feel		
18.	Nimbus Look and Feel (JDK 1.6u10)		
19.	Methods validate() and doLayout()		
20.	add(), remove(), removeAll() Components from a Container		
21.	Relational Database and and Structure Query Language (SQL)		
22.	Java Web Application - (Webapp)		
23.	Android SDK How to Install and Get Started		

K.L.N. College of Engineering

Department of Electrical and Electronics Engineering

EE6402- Transmission and Distribution [C212]

Important Questions/Tutorials/Assignments/Self-study/Seminar topics.

1. Course outcomes

Course	Course outcomes	POs
C212.1	List the basic elements of the electric power system, generation, transmission, distribution and describe the role played by each element	1,2
C212.2	Determine the losses, efficiency and parameters of the Transmission line.	1,2,4,6,7
C212.3	Analyze the Performance of Transmission Lines.	1,2,4,6,7
C212.4	Solve the voltage distribution in insulator strings, cables and methods to improve the same.	1,2,6,7,8
C212.5	Design overhead lines both Mechanical and electrical aspects using Sag calculation.	1,2,4,6,7

2. Mapping of Course Outcomes (COs), Course (C), Program Specific Outcomes (PSOs) withProgram Outcomes. (POs) – BeforeCBS [Levels of correlation: 3(High), 2(Medium), 1(low)

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C212.1	3	3	-	-	-	-	-	-	-	-	-	-	2	-	-
C212.2	3	3	-	1	-	2	3	-	-	-	-	-	2	-	1
C212.3	3	3	-	1	-	2	3	-	-	-	-	-	2	-	1
C212.4	3	3	-	-	-	3	3	1	-	-	-	-	2	-	1
C212.5	3	3	-	1	-	2	3	-	-	-	-	-	2	-	1
C212	3	3	-	1	-	2	2	-	-	-	-	-	2	-	1

3.PROGRAM OUTCOMES (POs)

Electrical and Electronics Engineering Graduates will be able to:

PO1: Engineering knowledge:
Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis:
Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

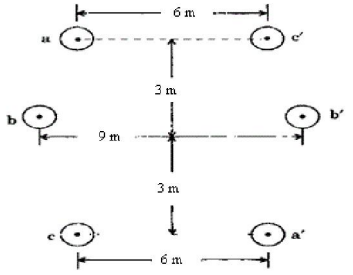
PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

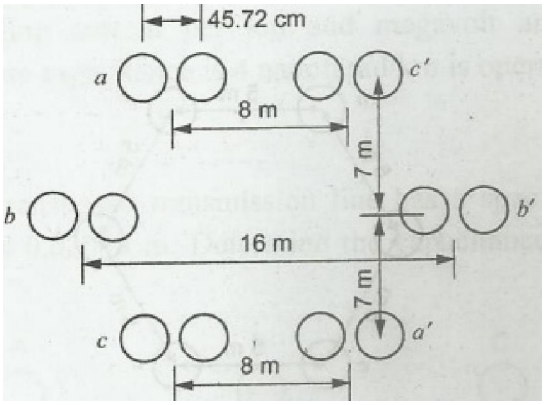
PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

S.No.	**4. Important Questions**	COs	POs
Q.1.1.	Draw and explain the structure of typical electric power system with various voltage levels. (16)	C212.1	1
Q.1.2.	Explain ring main distributor system. State its advantages. (8)	C212.1	1
Q.1.3.	Explain why EHVAC transmission is preferred? What are the problems involved in EHVAC transmission? (8)	C212.1	1

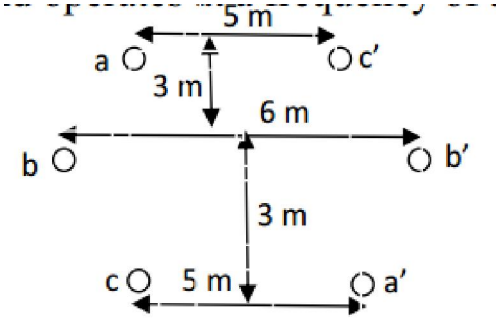
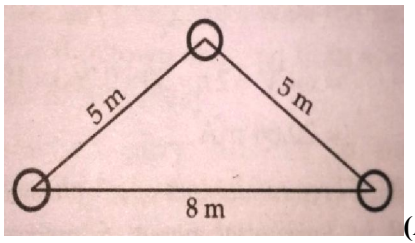
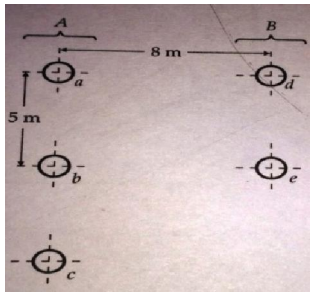
Q.1.4.	With a neat schematic diagram, explain the principle of HVDC system operation? Write any two advantages and disadvantages of HVDC system. (8)	C212.1	1
Q.1.5.	Explain the effect of high voltage on volume of copper and efficiency(8)	C212.1	1
Q.1.6.	Explain with a neat layout the modern EHV system. What is the highest voltage level available in India for EHV transmission? (16)	C212.1	1
Q.1.7.	(i) Write short notes on distributed and concentrated loads? (8) (ii) What are distributors? Explain it types in detail. (8)	C212.1	1
Q.1.8.	Explain in detail about various types of FACTS controllers. (16)	C212.1	1
Q.1.9	A DC ring main distributor is fed at A and the load is tapped at points B,C and D. The distributor length is 400 m long and points B,C,D are 150 m, 250 m, 375 m from A. Loads are 150 A, 40 A, 200 A respectively. If resistance per 100 m of single conductor is 0.04 Ω and V_A = 200V. Calculate (i) current in each distributor (ii) Voltage at points B,C and D. (16)	C212.1	1,2
Q.2.1.	(i) Distinguish between GMD and GMR. (8) (ii) Explain the following with respect to corona (a) Corona effects (b) Disruptive critical voltage (c) Visual critical voltage (d) Corona Power loss (8)	C212.2	1,6,7
Q2.2.	(i) Derive an expression for the loop inductance of a single phase line. (8) (ii) Deduce an expression for Inductance of three phase transmission line with symmetrical spacing (8)	C212.2	1,2
Q2.3.	A three phase circuit line consists of 7/4.5 mm hard drawn copper conductors. The arrangement of the conductors is shown in below figure. The line is completely transposed. Calculate inductive reactance per phase per km of the system.(16) 	C212.2	1,2,4
Q.2.4.	(i) Deduce an expression for Inductance of three phase transmission line with unsymmetrical spacing(10) (ii) Explain about interference between power and communication circuits. (6)	C212.2	1,6,7
Q2.5.	(i)Deduce an expression for capacitance of three phase transmission line with unsymmetrical spacing. (Transposed conductors)(10) (ii) Explain briefly about types of conductors (6)	C212.2	1,6,7
Q.2.6.	i) What are the advantages of bundled conductors? (4) ii) Derive expression for capacitance of a double circuit line for hexagonal pacing. (8) iii) Why is the concept of self GMD is not applicable for capacitance? (4)	C212.2	1,6,7
Q.2.7.	Derive the expression for inductance of a three phase double circuit line for hexagonal spacing. (16)	C212.2	1,4
Q.2.8.	A 50 Hz transposed line has its line conductors arranged in a line with unsymmetrical spacing. Radius of each conductor is 3 cm and the distance between conductors is 3 m. find the line to neutral capacitance for 1 km and the capacitive reactance for 1 km. (8)	C212.2	2,4
Q.2.9.	Find out the capacitance of a 1ϕ line 30 km long capacitance of two parallel wires each 15 mm diameter and 1.5 m apart. (8)	C212.2	1,2
Q.3.1.	i) Explain the classification of lines based on their length of transmission. (6) ii) What are ABCD constants?(10)	C212.3	1,6,7
Q.3.2.	Derive the expressions for sending end voltage in nominal T method and end Condenser method. (16)	C212.3	1
Q.3.3.	A balanced three phase load of 30MW is supplied at 132KV, 50Hz and 0.85 p.f. lagging	C212.3	1,2,4

	by means of a transmission line. The series impedance of a single conductor is (20+j52) Ω and the total phase-neutral admittance is $315*10^{-6}$ Siemen. Using nominal T method, Determine (i) A, B, C and D constants of the line (ii) sending end voltage (iii) regulation of the line. (16)		
Q.3.4.	A three phase 5 km long transmission line, having resistance of 0.5 Ω/km and inductance of 1.76mH/km is delivering power at 0.8 p.f lagging. The receiving end voltage is 32kV. If the supply end voltage is 33 kV, 50 Hz, find line current, regulation and efficiency of the transmission line. (16)	C212.3	1,2,4
Q.3.5.	Explain the real and reactive power flow in lines. Also explain the methods of voltage control. (16)	C212.3	1,6,7
Q.3.6.	A 3-phase, 50Hz, 40 km long overhead line has the following line constants: resistance per conductor=2.5 ohm, inductance per conductor=0.1H, capacitance per conductor=0.25μF. The line supplies a load of 36 MW at 0.8 power factor lagging at a voltage of 60 kV (phase) at the receiving end. Use nominal π representation, calculate sending end voltage, sending end current, sending end power factor, regulation and efficiency and active and reactive volt amperes. (16)	C212.3	1,2,4
Q.3.7.	What is an equivalent circuit of long line? Derive expression for parameters of this circuit in terms of line parameters. (16)	C212.3	1,6
Q.3.8.	A 50Hz transmission line 300 km long total series impedance of 40+j25 Ω and total shunt admittance of 10-3 mho. The 220 kV with 0.8 lagging power factor. Find the sending end voltage, current, power and power factor using nominal pi method.(16)	C212.3	1,2,4
Q.3.9.	Determine the efficiency and regulation of a three phase 200 km, 50 Hz transmission line delivering 100MW at a p.f of 0.8 lagging and 33kV to a balanced load. The conductors are of copper, each having resistance 0.1 Ω/km, and 1.5cm outside dia, spaced equilaterally 2m between centres. Neglect leakage reactance and use nominal T and π methods. (16)	C212.3	1,2,4
Q.3.10	Explain the Ferranti effect with a phasor diagram and its causes. (16)	C212.3	1,6,7
Q.4.1.	Discuss the methods to increase the value of string efficiency, with suitable sketches.(16)	C212.4	1,6,7
Q.4.2.	In a 3-unit insulator, the joint to tower capacitance is 20% of the capacitance of each unit. By how much should the capacitance of the lowest unit be increased to get a string efficiency of 90%? The remaining two units are left unchanged. (16)	C212.4	1,2
Q.4.3.	What are the various properties of insulators? Also briefly explain about suspension type and pin type insulators. Draw the schematic diagram. (16)	C212.4	6,7,8
Q.4.4.	A string of eight suspension insulators is to be graded to obtain uniform distribution of voltage across the string. If the capacitance of the top unit is 10 times the capacitance to ground of each unit, determine the capacitance of the remaining seven units. (10)	C212.4	1,2
Q.4.5.	i) Derive the expression for insulator resistance, capacitance and electric stress in a single core cable. Where is the stress maximum and minimum?(8) ii) A single core 66kv cable working on 3-phase system has a conductor diameter of 2cm and sheath of inside diameter 5.3cm. If two inner sheaths are introduced in such a way that the stress varies between the same maximum and minimum in the three layers find: a) position of inner sheaths b) voltage on the linear sheaths c) maximum and minimum stress (8)	C212.4	1,2,6, 7,8
Q.4.6.	Explain any two methods of grading of cables with necessary diagrams. (16)	C212.4	1,6,7
Q.4.7.	i) Give any six properties of a good insulator. (4) ii) With a neat diagram, explain the strain and stay insulators. (4) iii) A cable is graded with three dielectrics of permittivities 4, 3 and 2. The maximum permissible potential gradient for all dielectrics is same and equal to 30 kV/cm. The core diameter is 1.5cm and sheath diameter is5.5cm. (8)	C212.4	1,2,6, 7,8
Q.4.8.	(i) Explain any four insulating materials used in manufacturing of cables. (8) (ii)Describe with the neat sketch, the construction of a 3 core belted type cable. (8)	C212.4	1,6,7

Q.4.9.	i) Explain the constructional features of one LT and HT cable (8) ii) Compare and contrast overhead lines and underground cables. (8)	C212.4	6,7,8
Q.4.10.	(i)A 3 phase overhead transmission line is being supported by three disc insulators. The potential across top unit (i.e. near the tower) and the middle unit are 8kV and 11kV respectively. Calculate, a) The ratio of capacitance between pin and earth to the self-capacitance of each unit b) Line Voltage c) String Efficiency (4+2+2) (ii) A conductor of 1cm diameter passes centrally through porcelain cylinder of internal diameter 2 cms and external diameter 7cms. The cylinder is surrounded by a tightly fitting metal sheath. The permittivity of porcelain is 5 and the peak voltage gradient in air must not exceed 34kV/cm. Determine the maximum safe working voltage. (8)	C212.4	1,2
Q.5.1.	Assuming that the shape of an overhead line can be approximated by a parabola, deduce expressions for calculating sag and conductor length. How can the effect of wind and ice loadings be taken into account? (16)	C212.5	1,6,7
Q.5.2.	Write short notes on: (i) Sub mains (ii) Stepped and tapered mains (iii) Grounding grids. (5+5+6)	C212.5	1,6,7
Q.5.3.	Explain the following: (i) Neutral grounding (ii) Resistance grounding (8+8)	C212.5	1,6,7
Q.5.4.	Calculate the horizontal component of tension and maximum sag for a span of 300 m if the maximum tension in the conductor be 3500 kg and weight of conductor is 700 kg/km. Determine also the location of the points on the conductor at which the sag will be half of the above value. (16)	C212.5	1,2,4
Q.5.5.	Derive the expressions for sag and conductor length under bad weather conditions. Assume Shape of overhead line is a parabola. (16)	C212.5	1,6,7
Q.5.6.	Write short notes on AIS and GIS. (16)	C212.5	1,6,7
Q.5.7.	Derive expressions for sag and tension in a power conductor strung between to supports at equal heights taking into account the wind and ice loading also. (16)	C212.5	1,6,7
Q.5.8.	An overhead line has a span of 300m. The conductor diameter is 1.953 cm and the conductor weight is 0.844 kg/m. calculate the vertical sag when a wind pressure is 736 N/sq.m of projected area acts on conductor. The breaking strength of conductor is 77990 N and the conductor should not exceed half the breaking strength. (16)	C212.5	1,2,4
Q.5.9.	A transmission line has a span of 275 m between level supports. The conductor has an effective diameter of 1.96 cm and weight 0.865 kg/m. Its ultimate strength is 8060 kg. If the conductor has ice coating of radial thickness 1.27 cm and is subjected to a wind pressure of 3.9 gm/sq.cm of projected area, calculate sag for a safety factor of 2. Weight of 1 c.c of ice is 0.91 gm. (16)	C212.5	1,2,4
5. Tutorial Questions			
T.1.1.	A two wire DC distributor of 1 km long and it supplied a load of 90A, 70A, 50A and 40A at a distance of 200 m, 600 m, 900 m and 1000 m from feeding point A. the resistance of the distributor is 0.003Ω per 100 m length. Determine the voltage at each load point when the voltage at point A is 220V.	C212.1	1,2
T.1.2.	A 2 wire distributor is uniformly loaded at the rate 1.2 A/m and is fed at both the ends. The point minimum potential occurs at 575 m from end A and the minimum potential is 225V. if length of the distributor is 1 km, calculate the voltages at the feeding ends A and B. the resistance of each conductor is 0.04 Ω/km.	C212.1	1,2
T.1.3.	A 3 wire dc system takes a current of 50 A on positive sides and 45 A on negative sides. The resistance of each outer is 0.0004 Ω per meter while the cross section of wire is half of that of each outer. If the voltage between each outer and middle wire is maintained at 220 V at the feeding end, calculate the voltage at the distant load end between each outer and middle wire. The 3 wires are of 100 m length.	C212.1	1,2
T.1.4.	A single phase AC distributor is fed from end A and has a total impedance of (0.2+j0.3) Ω. At the far end the voltage V_B = 220V and the current is 80A at a Power factor of 0.8 lagging. At the midpoint M, a current of 100A is tapped at a Power factor of 0.6 lagging with respect to V_M at the midpoint. Calculate the supply voltage V_A and the phase angle	C212.1	1,2

	between V_A and V_B.		
T.1.5.	A 3 phase 4 wire distributor supplies a balanced voltage of 400/230V to a load consisting of 50 A at 0.8 power factor lagging for R phase, 50 A at 0.866 power factor lagging for Y phase and 50 A at unity power factor for B phase. The resistance of each line conductor is 0.2Ω. Calculate the supply end voltage for R phase. The resistance of neutral is 0.4Ω.	C212.1	1,2
T.2.1.	A three phase conductors of a three phase line are arranged at the corners of a triangle of sides 2m, 2.5m and 4.5m. Calculate the inductance per km of the line when the conductors are regularly transposed. The diameter of each conductor is 1.24cm.	C212.2	1,2,4
T.2.2.	A single phase transmission line has two parallel conductors 3 m apart, the radius of each conductor being 1 cm. Calculate the loop inductance per km length of the line if the material of the conductors is (i) copper (ii) steel with relative permeability of 100.	C212.2	1,2,4
T.2.3.	Determine the capacitance of 3 Phase double circuit line with two conductors having bundled spacing of 45.72 cm and having hexagonal spacing as shown in figure, operating at 50 Hz. The diameter of the conductor is 2.068 cm 	C212.2	1,2,4
T.2.4.	A 3 phase, 50 Hz, 132 kV overhead lie has conductors placed in a horizontal plane 4 m apart. Conductor diameter is 2 cm. if the line length is 100 km, Calculate the charging current per phase assuming complete transposition.	C212.2	1,2,4
T.2.5.	Estimate the corona loss for a three phase, 110 kV, 50 Hz, 150 km long transmission line consisting of three conductors each of 10 mm diameter and spaced 2.5 m apart in an equilateral triangle formation. The temperature of air is 30℃ and the atmospheric pressure is 750 mm of mercury. Take the irregularity factor as 0.85. Ionization of air may be assumed to take place at a maximum voltage gradient of 30 kV/cm.	C212.2	1,2,4
T.3.1.	A 3 phase 5 km long transmission line, having resistance of 0.50 Ω/km and inductance of 1.76 mH/km, is delivering power at 0.8 p.f lagging. The receiving end voltage is 33 kV. If the sending end voltage is 33 kV, 50 Hz find (i) line current (ii) Regulation (iii) efficiency of the transmission line.	C212.3	1,2,4
T.3.2.	Determine the efficiency and regulation of a 3phase, 100 km, 50 Hz transmission line delivering 20 MW at a power factor of 0.8 lagging and 66 kV to a balanced load. The conductors are of copper, each having resistance 0.1 Ω/ km, 1.5 cm outside diameter, spaced equilaterally 2 metres between centres. Use nominal T method.	C212.3	1,2,4
T.3.3.	A 220kV, 3Φtransmission line has impedance per phase of (40+j200) Ω and an admittance of (0+j0.0015) mho. Determine the sending end voltage and sending end current when the receiving end current is 200 A at 0.95 p.f lagging. Use nominal π method.	C212.3	1,2,4
T.3.4.	A three phase 50Hz transmission line, 40 km long delivers 36MW at 0.8 power factor lagging at 60 kV(phase). The line constant per conductors are R=2.5Ω, L=0.1H, C=0.25μF. Shunt leakage may be neglected. Determine the voltage, current, power factor, active power and reactive volt-amperes at the sending and. Also determine the efficiency and regulation of the line using nominal π method.	C212.3	1,2,4
T.3.5.	A 300 km 132 kV 3 phase overhead line has a total series impedance of 52+200j Ω per phase and a total shunt admittance of $j1.5*10^{-3}$ Siemens per phase to neutral. The line is supplying 40 MVA at 0.8 p.f lagging at 132 kV. Find sending end voltage, current, power	C212.3	1,2,4

	factor and power use (a) nominal π circuit and also. Find A, B, C and D constants of line.		
T.3.6.	The constants 3 phase line are A=0.9∠2° and B=140∠70° ohms per phase. The line delivers 60 MVA at 132 kV and 0.8 p.f lagging. Draw circle diagrams and find (a) sending end voltage and power angle (b) the maximum power which the line can deliver with the above values of sending and receiving end voltages (c) the sending end power and power factor (d) Line losses	C212.3	1,2,4
T.4.1.	In a 3-unit insulator, the joint to tower capacitance is 20% of the capacitance of each unit. By how much should the capacitance of the lowest unit be increased to get a string efficiency of 90%. The remaining two units are left unchanged.	C212.4	1,2
T.4.2.	A single core 66 KV cable working on 3-phase system has a conductor diameter of 2cm and sheath of inside diameter 5.3cm. If two inner sheaths are introduced in such a way that the stress varies between the same maximum and minimum in the three layers find: a) position of inner sheaths b) voltage on the linear sheaths c) maximum and minimum stress.	C212.4	1,2
T.4.3.	A 3 phase overhead transmission line is being supported by three disc insulators. The potential across top unit (i.e. near the tower) and the middle unit are 8kV and 11kV respectively. Calculate (a) The ratio of capacitance between pin and earth to the self-capacitance of each unit (b) Line Voltage (c) String Efficiency.	C212.4	1,2
T.4.4.	An insulator string has three units each having a safe working voltage of 15 kV. The ratio of unit self-capacitance to stray capacitance of earth is 10:1. Calculate string efficiency.	C212.4	1,2
T.4.5.	Calculate the capacitance, charging current and the insulation resistance of a single core cable 33 kV, 50 Hz and 2 km long having a core diameter of 2 cm and the sheath diameter of 7 cm. the relative permittivity of the insulation is 3.5 and the resistivity of the insulation is $4.5*10^{14}\ \Omega$ cm.	C212.4	1,2
T.4.6.	A single core cable of conductor diameter 2 cm and lead sheath of diameter 5.3 cm is to be used on a 66 kV, 3 phase system. Two inter sheaths of diameter 3.1 cm and 4.2 cm are introduced between the core and lead sheath. If the maximum stress in the layers is the same, find the voltages on the inter sheath.	C212.4	1,2
T.5.1.	An overhead line has a span of 336 m. The line is supported, at water crossing from two towers whose heights are 33.6 m and 29 m above water level. The weight of conductor is 8.33 N/m and tension in the conductor is not to exceed 3.34×10^4 N. Find (i) Clearance between the lowest point on the conductor and water (ii) horizontal distance of this point from the lower support.	C212.5	1,2,4
T.5.2.	A transmission line conductor at a river crossing is supported from two towers at a height of 50 and 80 m above water level. The horizontal distance between the towers is 300 m. if the tension in the conductor is 2000 kg find the clearance between the conductor and water at a point midway between the towers. Weight of conductor/m = 0.844 kg. Derive the formula used.	C212.5	1,2,4
T.5.3.	A transmission line has a span of 275 m between level supports. The conductor has an effective diameter 1.96 cm and weighs 0.865 kg/m. Its ultimate strength is 8060 kg. If the conductor has ice coating of radial thickness 1.27 cm and is subjected to a wind pressure of 3.9 gm./cm^2 of projected area, Calculate sag for a safety factor of 2. Weight of 1cc of ice is 0.919 m.	C212.5	1,2,4
T.5.4.	For river crossing tower, the heights of the supports of the transmission line from the water level are 60 m and 90 m at the two ends of the river respectively. The tension in the conductor and water at a point mid-way between the towers. Weight of the conductor per meter is 0.844 kg. Consider the span of the river 350 cm.	C212.5	1,2,4
T.5.5.	A transmission line conductor is supported on the towers of unequal heights. The first tower has a height of 30 m and the second tower has a height of 50 m. The distance between the towers is 150 m. Tension in the conductor is 2200 kg and cross section of the conductor is 2 cm^2. The specific gravity of the conductor material is 9.5 gm/cm^3 and the wind pressure is 150 kg/m^2. Calculate the sag.	C212.5	1,2,4
T.5.6.	Determine the inductance of Peterson coil to be connected between the neutral and ground	C212.5	1,2,4

	to neutralize the charging current of overhead line having the line to ground capacitance of 0.15μF. If the supply frequency is 50 Hz and the operating voltage is 132kV, Find the kVA rating of the coil.		
	6. Assignments		
A.2.1	Find the inductance /phase /km of double circuit 3phase line shown in fig. the line is completely Transposed and operates at a frequency of 50Hz. Radius r = 6mm  **(Ans: L/ph = 0.65 mH/km)**	C212.2	1,2,4
A.2.2.	A single circuit, three phase, 50 Hz transmission line consists of three conductors arranged as shown. If the conductors have diameter equal to 0.8 cm find the inductive reactance of 25 km long line per km per phase. Also calculate the capacitance and capacitive reactance of the transmission line.  **(Ans: C = 0.350 F & X_C = 9.1KΩ)**	C212.2	1,2,4
A.2.3.	A single phase transmission line consists of 3 conductors of 3 mm radii in "Go" conductor and 2 conductors of 6 mm radii in "Return" conductor as shown. Calculate the inductance of the line.  **(Ans:L_A=0.61 mH/km, L_B =0.82 mH/km, L =1.43 mH/km)**	C212.2	1,2,4
A.3.1.	A single phase transmission line delivers 2 MW of power at the receiving end at a voltage of 33 kV and 0.9 p.f lagging. The total resistance of the line is 10 Ω and the total inductive reactance is 18 Ω. Determine: (i) Percentage voltage regulation (ii) sending end power factor and (iii) transmission efficiency. **(Ans: vtgReg=4.315%, Cos ϕ_S=0.79 lagging, =97.21%)**	C212.3	1,2,4
A.3.2.	A 3 phase 50 Hz overhead transmission line has the following distributed parameters: resistance = 28 Ω ; inductive reactance = 63 Ω ; Capacitive susceptance = 4 * 10^{-4} mho. If the load at the receiving end is 75 MVA at 0.8 p.f. lagging with 132 kV between lines, Calculate (a) voltage (b) current (c) power factor at the sending end (d) Regulation and (e) efficiency of transmission for this load. Use (i) nominal T method (ii) nominal method. Compare the results obtained by the two methods.	C212.3	1,2,4
A.3.3.	Determine A,B,C and D constants for a 3-phase 50 Hz transmission line 200 km long having the following distributed parameters: l = 1.20*10^{-3} H/km, c = 8*10^{-9} F/km, r = 0.15	C212.3	1,2,4

A.4.1.	Each line of a 3-phase system is suspended by a string of 3 similar insulators. If the voltage across the line unit is 17.5 kV, Calculate the line to neutral voltage. Assume that the shunt capacitance between each insulator and earth is $1/8^{th}$ of the capacitance of the insulator itself. Also find the string efficiency. **(Ans: Vtgbwt line and neutral = 44.25 kV, string η = 84.28%)**	C212.4	1,2,4, 6,7
A.4.2.	A string of 6 suspension insulators is too fitted with a guard ring. The pins to earth capacitances are all equal to C. What should be the values of line to pin capacitances so as to have uniform voltage distribution over the string? **(Ans: C_1= 1/5C, C_2=1/2C,C_3=C,C_4=2C,C_5=5C)**	C212.4	1,2,4, 6,7
A.4.3.	A single core lead sheathed cable is graded by using two dielectrics of relative permittivity 3.6 inner and 2.5 outer, the thickness of each being 1 cm. The core diameter is 1 cm. System voltage is 66 kV, 3-phase. Determine the maximum stress in the two dielectrics. **(g_{1max} = 58.76 kV/cm, g_{max} = 28.21 kV/cm)**	C212.4	1,2,4, 6,7

6. Self-Study Topics

S.No	UNIT	TOPIC	Text / Ref book / Journals
1	4	Grading of cables	Analysis of Grading Techniques in XLPE Cable Insulation by FEM / IJRET: International Journal of Research in Engineering and Technology, eISSN: 2319-1163 | pISSN: 2321-7308
2	5	Sag and Tension Calculation for different Weather Conditions	The Overhead Line Sag Dependence on Weather Parameters and Line Current / Department of Information Technology, Uppsala University, Box 337, SE- 751 05, Uppsala. ISSN 1401-5765

7. Seminar topics

S.No	UNIT	TOPIC
1.	5	Line Location of Sag and Tension analysis
2.	5	Conductor Vibrations & Motion caused by Fault current in Mechanical Design
3.	5	National Electric safety code for Sag and Tension analysis
4.	5	An overview of grounding system
5.	5	How to design an effective earthing system to ensure the safety of the people
6.	5	Design of Earthing system for HV/EHV AC substation
7.	5	Gas Insulated Substation Grounding System Design
8.	5	Advanced Practical Considerations of Fault Current Analysis in Power System Grounding Design
9.	5	The Smart Ground Multimeter
10.	5	Factors affecting Mechanical Design of Overhead Transmission Lines
11.	5	Cascaded Transformers Method for Generating AC High Voltage
12.	5	Cooling Methods of Power Transformer in sub-station
13.	5	Earth Grounding Resistance-Principles, testing methods and applications
14.	5	Key Diagram of 66/11 kV substation
15.	5	Photovoltaic system for transmission substation application
16.	5	Application of Sag Template for Tower Spotting
17.	5	Design of Transmission Line Towers
18.	5	Substation Design
19.	5	Advanced substation protection equipments
20.	5	Application of AIS and GIS
21.	5	Impact of Power Factor Correction
22.	5	Application of Corona ring in transmission line
23.	5	Use of computer for preparing sag template and the tower spotting
24.	5	High-Voltage Power Electronic Substations
25.	5	Role of Substations in Smart Grids.
26.	5	Interface between Automation and the Substation
27.	5	Lightning Stroke Shielding of Substations
28.	5	SCADA Communication Protocols: Past, Present, and Future
29.	5	Smart Grid Technology
30.	5	Electricity Storage: A New Flexibility Option for Future Power Systems (Book: Advanced Technologies for Future Transmission Grids-Gianluigi Migliavacca)

K.L.N. COLLEGE OF ENGINEERING

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
EE6403 – Discrete Time Systems & Signal Processing
Important Questions/Tutorials/Assignments/Self study/Seminar topics

1. Course Outcomes

Course	Course Outcome	POs	PSOs
C213.1	Classify the different types of signals and systems and Explain the sampling process of continuous time signal.	1,2,3,5,12	1,2
C213.2	Apply z-transform and inverse Z transform and analyze discrete time systems.	1,2,3,5,12	1,2
C213.3	Apply Radix-2 Decimation in Time (DIT) and Decimation in Frequency (DIF) FFT Algorithm to Compute Discrete Fourier Transform.	1,2,3,5,12	1,2
C213.4	Explain different types of Infinite Impulse Response (IIR) filters and Finite Impulse Response (FIR) filters.	1,2,3,5,12	1,2
C213.5	Explain various architectures of Digital signal processors.	1,2,3,5,12	1,2

2. Mapping of Course Outcomes (COs), Course (C), Program Specific Outcomes (PSOs) with Program Outcomes (POs) – before CBS [Levels of correlation: 3(High), 2(Medium), 1(low)]

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C213.1	3	2	2	-	1	-	-	-	-	-	-	1	2	1	-
C213.2	3	2	2	-	1	-	-	-	-	-	-	1	2	1	-
C213.3	3	2	2	-	1	-	-	-	-	-	-	1	2	1	-
C213.4	3	2	2	-	1	-	-	-	-	-	-	1	2	1	-
C213.5	3	2	2	-	1	-	-	-	-	-	-	1	2	1	-
C213	3	2	2	-	1	-	-	-	-	-	-	1	2	1	-

3. PROGRAM OUTCOMES (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

4. IMPORTANT QUESTIONS

S. No.	Questions	COs	POs
	UNIT I - INTRODUCTION		
Q.1.1	Distinguish the following with examples and formulae. (i) Energy vs Power signal.	C213.1	1

	(ii) Time variant vs Time invariant signal.		
Q.1.2	Explain the block diagram of a Digital Signal Processing system with a neat diagram.	C213.1	1
Q.1.3	(i) Test the causality &stability of the given system: y(n)=x(-n)+x(n-2)+x(2n-1) (ii) Test the system for linearity and time invariance: y(n)=(n-1)x(n)+c	C213.1	1,2,3
Q.1.4	Determine the input signal $x(n)$ that will generate the output sequence $y(n) = \{1, 5, 10, 11, 8, 4, 1\}$ for a system with impulse response $h(n) = \{1,2,1\}$.	C213.1	1,2,3
Q.1.5	A discrete time system is represented by the following difference equation in which $x(n)$ is input and y(n) is output. y(n)=3y(n-1)-nx(n)+4x(n-1)+2x(n+1); and n≥0. Is this system linear, shift invariant and causal? In each case, justify your answer.	C213.1	1,2,3
Q.1.6	Determine whether the following is an energy signal or power signal. (i) x_1(n)=6 $\cos\left(\frac{\pi}{2}n\right)$ (ii) x_2(n)=3$(0.5)^n$ x(n) (iii)$x_3(n) = \left(\frac{1}{3}\right)^n u(n)$ (iv) $x_4(n) = e^{2n}u(n)$	C213.1	1,2,3
Q.1.7	(i) A signal $x(t) = sinc(50\pi t)$ is sampled at a rate of (1) 20 Hz (2) 50 Hz and (3) 75 Hz. For each of these cases, explain how to recover the signal $x(t)$ from these sample signals. (ii) Determine whether or not each of the following signals is periodic. If the signal is periodic, specify its fundamental period. (a) $x(n) = e^{j6\pi n}$ (b) $x(n) = \cos\frac{\pi}{3}n + \cos\frac{3\pi}{4}n$.	C213.1	1,2,3
Q.1.8	(i) Explain the properties of discrete time system. (ii) Explain quantization and quantization error.	C213.1	1
Q.1.9	State and explain sampling theorem both in time domain and in frequency domain.	C213.1	1,2
Q.1.10	(i) Classify the types of elementary continuous & discrete time signals. (ii) State and prove the Sampling theorem.	C213.1	1,2
UNIT II - DISCRETE TIME SYSTEM ANALYSIS			
Q.2.1	Evaluate the impulse response $h(n)$for $y(n) = x(n) + 2x(n-1) - 4x(n-2) + x(n-3)$.	C213.2	1,2,3
Q.2.2	(i) Determine$x(n)$ if $X(z) = \frac{1+\left(\frac{1}{2}\right)z^{-1}}{1-\frac{1}{2}z^{-1}}$ (ii) Determine the response of the causal system $y(n) - y(n-1) = x(n) + x(n-1)$ to the input $x(n) = u(n)$. Test its stability.	C213.2	1,2,3
Q.2.3	Determine the z-transform and ROC of x(n)=r^ncos(nθ)u(n) and $x(n) = n^2u(n)$.	C213.2	1,2,3
Q.2.4	(i) Evaluate the ROC of a finite duration signal $x(n) = \{2, -1, -2, -3, 0, -1\}$. (ii) Determine Inverse Z-transform for $(z) = 1/(z-1.5)^4$; ROC: |z| > ¼.	C213.2	1,2,3
Q.2.5	Determine the impulse response, frequency response, magnitude response and phase response of second order system $y(n) - y(n-1) + \frac{3}{16}y(n-2) = x(n) - \frac{1}{2}x(n-1)$.	C213.2	1,2,3
Q.2.6	Determine the frequency response of the LTI system governed by the equation $y(n) = a_1y(n-1) - a_2y(n-2) - x(n)$.	C213.2	1,2,3

Q.2.7	Determine inverse z-transform of x(z)=z/($3z^2$-4z+1), Roc: (i) lzl>1, (ii) |z|<1/3, (iii) $\frac{1}{3} < |z| < 1$	C213.2	1,2,3
Q.2.8	Determine the impulse response h(n) for which z-transform is given by H(z) =$\frac{2+3z^{-1}}{[1+z^{-1}]\left(1+\frac{1}{2}z^{-1}\right)\left(1-\frac{1}{4}z^{-1}\right)}$.	C213.2	1,2,3
Q.2.9	State the advantages of convolution technique. Determine circular convolution of two sequences, $x_1(n)=\{2,1,2,1\}$ and $x_2(n)=\{1,2,3,4\}$.	C213.2	1,2,3
Q.2.10	Using z transform, determine the response y(n) for n≥ 0 if y(n)=$\frac{1}{2}$y(n-1)x(n), x(n)=$\left(\frac{1^n}{3}\right)$y(n); y(-1)=1	C213.2	1,2,3
UNIT III - DISCRETE FOURIER TRANSFORM &COMPUTATION			
Q.3.1	State the need for frequency response analysis. Determine the frequency response and plot the magnitude response and phase response for the system $y(n) = 2x(n) + x(n-1) + y(n-2)$.	C213.3	1,2,3
Q.3.2	An 8 point sequence is given by x(n)={2,2,2,2,1,1,1,1} , compute DFT of x(n) using radix-2 DIT-FFT.	C213.3	1,2,3
Q.3.3	Describe the need for Bit reversal and determine 8 point DFT of the sequence x(n)={1,1,1,1,1,1,0,0} using DIT method.	C213.3	1,2,3
Q.3.4	Determine the IDFT of the sequence $X(K) = \{4, 1-j2.414,\ 0,\ 1-j0.414, 0, 1+j0.414, 1+j2.414\}$ using DIF algorithm.	C213.3	1,2,3
Q.3.5	State and Prove the differentiation and convolution properties of DFT.	C213.3	1,2
Q.3.6	Summarize the steps of radix-2 DIT and DIF algorithm with its flow graph.	C213.3	1
Q.3.7	Determine the DFT of a sequence x(n)={1,2,3,4,4,3,2,1} using DIT algorithm.	C213.3	1,2,3
Q.3.8	Determine the DFT of the sequence $x(n) = \begin{cases} \frac{1}{4}, & for\ 0 \le n \le 2 \\ 0, & otherwise \end{cases}$	C213.3	1,2,3
Q.3.9	(i) Given x(n)=n+1, and N=8, determine X(K) using DIT, FFT algorithm. (ii) Use 4-point inverse FFT for the DFT result {6, -2+j2, -2, -2-j2} and determine the input sequence.	C213.3	1,2,3
Q.3.10	Explain decimation in frequency algorithm. Write the similarities and differences between DIF and DIT algorithms.	C213.3	1
UNIT IV - DESIGN OF DIGITAL FILTERS			
Q.4.1	(i) Explain the role of windowing to realize a FIR filter. (ii) Compare and explain on the choice and type of windows selection for signal analysis. (iii) Compare Butterworth and Chebyshev filter.	C213.4	1
Q.4.2	A difference equation describing a filter is given by $y(n) - 2y(n-1) + y(n+2) = x(n) + \frac{1}{2}x(n-1)$. Determine direct form II structure.	C213.4	1,2,3
Q.4.3	Design a chebyshev filter for the following specification using bilinear transformation. $0.8 \le |H(ejw)| \le 1$ $\quad 0 \le w \le 0.2\pi$ $|H(ejw)| \le 0.2$ $\quad 0.6\pi \le w \le \pi$	C213.4	1,2,3
Q.4.4	Given the specifications α_p = 3dB, α_s = 10 dB, f_p = 1 kHz and f_s = 2 kHz. Determine the order of the filter using Chebyshev approximation and H(s).	C213.4	1,2,3

Q.4.5	Compute numerically the effect of Hamming windows and design the filter if Cut-off frequency = 100 Hz. Sampling frequency = 1000 Hz. Order of filter = 2 Filter length required = 5	C213.4	1,2,3
Q.4.6	Design an ideal low pass filter with a frequency response $H_d(e^{j\omega}) = 1$ for $\frac{-\pi}{2} \leq \omega \leq \frac{\pi}{2}$ $= 0$ for $\frac{\pi}{2} \leq \lvert\omega\rvert \leq \pi$ Determine the values of $h(n)$ for N=11, H(z) and the filter coefficients.	C213.4	1,2,3
Q.4.7	Compute the system function of the digital filter if the analog filter is $H_a(s)=1/[(s+0.2)^2 + 2]$. Using the impulse invariance method and the Bilinear transformation method, design the digital filter.	C213.4	1,2,3
Q.4.8	Determine H(z) for a Butterworth filter satisfying the following constraints. $\sqrt{0.5} \leq \lvert H(e^{j\omega})\rvert \leq 1; \quad 0 \leq \omega \leq \frac{\pi}{2}$ $\lvert H(e^{j\omega})\rvert \leq 0.2; \quad \frac{3\pi}{4} \leq \omega \leq \pi$ with T=1 s. Apply impulse invariant transformation.	C213.4	1,2,3
Q.4.9	Apply bilinear transformation to $H(s) = \frac{2}{(s+1)(s+2)}$ with T=1 sec and computeH(z).	C213.4	1,2,3
Q.4.10	Compare and analyze Hanning and Hamming windowing technique of filter design.	C213.4	1
UNIT V – DIGITAL SIGNAL PROCESSORS			
Q.5.1	Explain in detail about MAC unit and pipelining.	C213.5	1
Q.5.2	Design a DSP based system for the process of Audio signals in an audio recorder system.	C213.5	1,2,3
Q.5.3	Draw the functional block diagram of a digital signal processing processor and explain.	C213.5	1
Q.5.4	Explain the datapath architecture and the bus structure in a DSP processor with suitable diagram.	C213.5	1
Q.5.5	Ellaborate on Radar signal processing using a DSP processor.	C213.5	1
Q.5.6	Explain in detail about TMS320C54 DSP processor and of its memory architecture with suitable block diagram.	C213.5	1
Q.5.7	Compare the general purpose processor and DSP processor.	C213.5	1,2
Q.5.8	Explain various addressing modes of a digital signal processor with an example.	C213.5	1
Q.5.9	Draw & explain different types of DSP architecture.	C213.5	1
Q.5.10	Write a note on commercial DSP processor.	C213.5	1
5. TUTORIAL QUESTIONS			
T.1.1	(i) Test the causality and stability of the system, $y(n) = x(-n) + x(n-2) + x(2n-1)$**ANS: Noncausal and stable** (ii) Test the linearity and time invariance of the system, $y(n) = (n-1)x^2(n) + C$**ANS: Nonlinear and Time variant** **AU-Nov/Dec 2015**	C213.1	1,2,3
T.1.2	(i) A signal $x(t) = sinc(150\pi t)$ is sampled at a rate of (a) 100 Hz (b) 200Hz (c) 300 Hz. For each of these three cases, explain how the signal x(t) can be recovered from the sampled signal.	C213.1	1,2,3

	ANS: (a) Signal x(t) cannot be recovered. **(b) & (c) Signal x(t) can be recovered.** (ii) The analog signal is given by $x(t) = 5\cos(2000\pi t) + 3\sin(6000\pi t) + 2\cos(12{,}000\pi t)$(a) Determine the Nyquist rate for this signal. **ANS: 12kHz** (b) If the sampling rate f_s=5000 samples/s, find the discrete-time signal x(n) after sampling. **ANS: $x(n) = 7\cos 2\pi\left(\frac{1}{5}\right)n - 3\sin 2\pi\left(\frac{3}{5}\right)n$**		
T.1.3	(i) Determine whether the following signals are periodic or not. If periodic determine fundamental period. (a) $x(t) = \sin\sqrt{2}\,\pi t$**ANS: Periodic with T_0=1.414 second** (b)$x(t) = sin^2 t$**ANS: Periodic with $T_0=\pi$** (ii) Determine whether the following signal is energy signal, power signal, or neither. $x(n) = \begin{Bmatrix} 3(-1)^n, n \geq 0 \\ 0,\ n < 0 \end{Bmatrix}$**ANS: Power signal with 4.5W.**	C213.1	1,2,3
	UNIT II - DISCRETE TIME SYSTEM ANALYSIS		
T.2.1	(i) Determine the z-transform of the signal $x(n) = \delta(n+1) + 3\delta(n) + 6\delta(n-3) - \delta(n-4)$. **ANS: $X(z) = z + 3 + 6z^{-3} - z^{-4}$** (ii) Apply differentiation property and determine the z transform for the signal,x(n) = n(-1)^n u(n) **ANS: $\frac{-z}{(z+1)^2}$**	C213.2	1,2,3
T.2.2	A system is described by the difference equation $y(n) - \left(\frac{1}{2}\right)y(n-1) = 5x(n)$. Determine the solution, when the input $x(n) = \left(\frac{1}{5}\right)^n u(n)$ and the initial condition is given by$y(-1) = 1$, using z transform. **ANS: $y(n) = \frac{-10}{3}\left(\frac{1}{5}\right)^n u(n) + \frac{53}{6}\left(\frac{1}{2}\right)^n u(n)$**	C213.2	1,2,3
T.2.3	Determine the impulse response, frequency response, magnitude and phase responses of the second order system $y(n) - y(n-1) + \frac{3}{16}y(n-2) = x(n) - \frac{1}{2}x(n-1)$. **AU-May/June 2016** **ANS: $h(n) = 0.5\left\{\left(\frac{3}{4}\right)^n + \left(\frac{1}{4}\right)^n\right\}u(n)$, $H(z)\big\|_{z=e^{j\omega}} = H(e^{j\omega}) = \frac{0.5}{1-\frac{3}{4}e^{-j\omega}} + \frac{0.5}{1-\frac{1}{4}e^{-j\omega}}$, $\left\|H(e^{j\omega})\right\| = \frac{\|(e^{j\omega}-0.5)\|}{\|(e^{j\omega}-0.25)\|(e^{j\omega}-0.75)\|}$ and $\phi(\omega) = \omega + arg(e^{j\omega} - 0.5) - arg(e^{j\omega} - 0.25) - arg(e^{j\omega} - 0.75)$**	C213.2	1,2,3
	UNIT III - DISCRETE FOURIER TRANSFORM &COMPUTATION		
T.3.1	Derive the DFT for the sequences {1, 1, 2, 2, 3, 3} and compute the corresponding amplitude and phase spectrum. **AU-April/May 2015** **ANS: X(K)={12, -1.5+j2.598, -1.5+j0.866, 0, -1.5-j0.866, -1.5-j2.598};** **|X(k)|={12, 2.999, 1.732, 0, 1.732, 2.999} and** **$\angle X(k) = \{0, -\frac{\pi}{3}, -\frac{\pi}{6}, 0, \frac{\pi}{6}, \frac{\pi}{3}\}$**	C213.3	1,2,3
T.3.2	Determine the inverse DFT of $X(K) = \{7, -\sqrt{2} - j\sqrt{2}, -j, \sqrt{2} - j\sqrt{2}, 1, \sqrt{2} + j\sqrt{2}, j, -\sqrt{2} + j\sqrt{2}\}$. **AU- Nov/Dec 2015** **ANS: x(n)={1, 1, 1, 1, 1, 1, 1, 0}**	C213.3	1,2,3

T.3.3	An input sequence x(n)={2, 1, 0, 1, 2} is applied to a DSP system having an impulse response h(n)={5, 3, 2, 1}. Determine the output sequence produced by (a) linear convolution and (b) verify the same through circular convolution. **ANS: y(n)={10, 11, 7, 9, 14, 8, 5, 2}**	C213.3	1,2,3
UNIT IV - DESIGN OF DIGITAL FILTERS			
T.4.1	Design a Butterworth filter for the following specification using Impulse invariancemethod. $0.8 \leq \lvert H(e^{j\omega})\rvert \leq 1$ $0 \leq \omega \leq 0.2\pi$ **AU – Nov/Dec 2015** $\lvert H(e^{j\omega})\rvert \leq 0.2$ $0.6\pi \leq \omega \leq \pi$ **ANS:** $\boldsymbol{H(z) = \frac{0.39z^{-1}}{1-0.97z^{-1}+0.32z^{-2}}}$	C213.4	1,2,3
T.4.2	Apply cascade and parallel form realization for the system y(n) = -0.1y(n-1) + 0.2y(n-2) + 3x(n) + 3.6x(n-1) + 0.6x(n-2) **ANS: Cascade: H(z) =$H_1(z)$ + $H_2(z)$, Parallel: H(Z)=C+ $H_1(z)$ + $H_2(z)$**	C213.4	
T.4.3	A low pass filter is to be designed with the following desired frequency response. $H_d(e^{j\omega}) = \{e^{-j2\omega}, \frac{-\pi}{4} \leq \lvert\omega\rvert \leq \frac{\pi}{4}$ $0, \frac{\pi}{4} \leq \lvert\omega\rvert \leq \pi$ Determine the filter coefficients $h_d(n)$ if the window function is defined as $\omega(n) = \begin{cases}1, & 0 \leq n \leq 4\\ 0, & otherwise\end{cases}$ **AU-April/May 2015** **ANS: h(0)=h(4)=-1/2π, h(2)=3/4, h(1)=h(3)=1/$\sqrt{2}\pi$**	C213.4	
6. ASSIGNMENT QUESTIONS			
UNIT I - INTRODUCTION			
A.1.1	Generate unit impulse, unit step, sinusoidal and exponential sequences using MATLAB program. [Refer Pg. No. 845, 'Digital Signal Processing' (3rd Edition) by S. Salivahanan]	C213.1	1,2,3,5,12
A.1.2	Analyze whether the following discrete time systems are: (i) Static or dynamic (ii) Linear or non-linear (iii) Shift invariant or shift variant (iv) Causal or non-causal (v) Stable or unstable. *(a)* $y(n) = \cos[x(n)]$ **Ans: static, non-linear, shift invariant, causal andstable.** (b) $y(n) = x(-n+2)$ **Ans: dynamic, linear, shift invariant, non-causal and stable.** (c) $y(n) = x(n) + nx(n+1)$ **Ans: dynamic, linear, shift variant, Non-causal and unstable.**	C213.1	1,2,3
A.1.3	Determine the range of values of a and b for which the linear time-invariant system with impulse response $h(n) = \begin{cases}a^n, n \geq 0\\ b^n, n < 0\end{cases}$ is stable. **ANS: The system is stable if both |a|<1 and |b|>1 are satisfied.**	C213.1	1,2,3
UNIT II - DISCRETE TIME SYSTEM ANALYSIS			
A.2.1	The response h(t) of a linear time invariant system to an impulse $\delta(t)$, under initially relaxed condition is $h(t) = e^{-t} + e^{-2t}$. Determine the response of this system for a unit step input $u(t)$. **ANS:** $\boldsymbol{(1.5 - e^{-t} - 0.5e^{-2t})u(t)}$ **GATE 2011**	C213.2	1,2,3

A.2.2	Determine the linear convolution of $x(n) = \{2,4,6,8,10\}$ with $h(n) = \{1,3,5,7,9\}$ using MATLAB program. . **Ans:** $\mathbf{x(n) * h(n) = \{2, 10, 28, 60, 110, 148, 160, 142, 90\}}$ [Refer Pg.No. 848, 'Digital Signal Processing' (3rd Edition) by S. Salivahanan]	C213.2	1,2,3,5,12
A.2.3	Determine the system function and the unit sample response of the system described by the difference equation $y(n) = \frac{1}{2}y(n-1) + 2x(n)$. **ANS:** $\boldsymbol{H(z) = \frac{2}{1-\frac{1}{2}z^{-1}}; h(n) = 2\left(\frac{1}{2}\right)^n u(n)}$	C213.2	1,2,3
UNIT IV - DESIGN OF DIGITAL FILTERS			
A.4.1	Design a lowpass FIR filter with N=11 for the following specifications using MATLAB. Passband frequency edge=0.25 kHz and Sampling frequency=1kHz. Use Hanning window in the design. [Refer Pg.No. 1098, 'Digital Signal Processing Principles, Algorithms and Application'(4th Edition) by J.G. Proakis& D.G. Manolakis]	C213.4	1,2,3,5,12
A.4.2	Design a Butterworth analog lowpass filter with following specifications: Passband attenuation in dB=0.4 Stopband attenuation in dB=30 Passband frequency=400 Hz Stopband frequency=800 Hz Sampling frequency= 2000 Hz using MATLAB program. [Refer Pg.No.859, 'Digital Signal Processing' (3rd Edition) by S. Salivahanan]	C213.4	1,2,3,5,12

7. SEMINAR TOPICS

1. Applications of DSP in Grid Automation
2. Applications of DSP in Biomedical Engineering
3. Applications of DSP to Image Processing
4. Factors influencing selection of DSP processors
5. Application of DSP to Radar
6. Introduction of MATLAB for DSP applications
7. Introduction of C programming for DSP applications
8. DSP based audio recorder system for the process of Audio signals
9. DSP based motor control
10. DSP for wireless and mobile Communication
11. Commercial DSP processors
12. Pipelining & Parallelism
13. Factors influencing the choice and type of windows selection for signal analysis.
14. Relationship of DFT to other transformation techniques
15. Parameter selection to calculate DFT
16. Digital Differentiator
17. Adaptive filters
18. Power Spectrum Estimation
19. Applications of FFT Algorithms
20. A/D and D/A converters
21. Properties of Fourier transform for DT signals
22. Quantization and errors in DS processor
23. Relationship between s-plane and z-plane
24. Comparison of Analog and Digital signal processors
25. ADSP processor

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Department of Electrical and Electronics Engineering

EE6404 & MEASUREMENTS AND INSTRUMENTATION [C214]

Important Questions/Assignments/ Self-study /Seminar topics.

1. Course outcomes

COs	Course Outcomes	POs	PSOs
C214.1	Describe the basic functional block elements in Different measuring Instruments and the errors in the measurement system	1,2	1
C214.2	Select the suitable instrument for measuring different electrical and magnetic parameters	1,2,3	1
C214.3	Design a suitable Bridge circuit to determine the values of various resistor, inductor and capacitor	1,2,3,4	1
C214.4	Explain the construction and working principle of various types of storage and display devices and compare them	1,7	-
C214.5	Compare the various types of transducers and explain the function of different blocks involved in data acquisition systems	1,5	2

2. Mapping of Course Outcomes (COs) , Course (C), Program Specific Outcomes (PSOs) withProgram Outcomes. (POs) – before CBS[Levels of correlation:3(High),2(Medium),1(low).

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C214.1	2	2	-	-	-	-	-	-	-	-	-	-	1	-	-
C214.2	2	1	2	-	-	-	-	-	-	-	-	-	1	-	-
C214.3	2	2	3	2	-	-	-	-	-	-	-	-	2	-	-
C214.4	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-
C214.5	1	-	-	-	2	-	-	-	-	-	-	-	-	1	-
C214	2	1	1			-	-	-	-	-	-	-	1	-	-

3. PROGRAM OUTCOMES (POs)

Electrical and Electronics Engineering Graduates will be able to:

PO1: Engineering knowledge:

Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis:

Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions:

Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems:

Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage:

Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO7:Environment and sustainability:

Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

S.No.	4. Important Questions.	COs	POs
Q.1.1.	What are the various important functional elements of a measurement systems?	C214.1	1
Q.1.2.	Draw the functional elements of a measurement systems.	C214.1	1
Q.1.3.	What is the importance of static & dynamic characteristics of systems?	C214.1	1
Q.1.4.	Define static accuracy and sensitivity. [3]	C214.1	1

Q.1.5.	Distinguish between accuracy and precision.	C214.1	1
Q.1.6.	What are the static characteristics of an instrument?	C214.1	1
Q.1.7.	Define resolution and precision. [2]	C214.1	1
Q.1.8.	Differentiate resolution from threshold.	C214.1	1
Q.1.9.	Name the dynamic characteristics of measurement systems. [2]	C214.1	1
Q.1.10.	Define measuring lag and fidelity of dynamic characteristics of instrument.	C214.1	1
Q.1.11.	What is meant by absolute error of measurement?	C214.1	1
Q.1.12.	How are absolute and relative errors expressed mathematically?	C214.1	1
Q.1.13.	Give the international standards of instruments.	C214.1	1
Q.1.14.	Write down the different standards of an instrument.	C214.1	1
Q.1.15.	Why must instruments be calibrated?	C214.1	1
Q.1.16.	What is meant by calibration of an instrument? List its methods. [2]	C214.1	1
Q.1.17.	What is the significance of calibration? [3]	C214.1	1
Q.2.1.	Write any four types of analog ammeter used for instrumentation.	C214.2	1
Q.2.2.	How are basic instruments converted into higher range ammeter? [2]	C214.2	1
Q.2.3.	Write any four types of analog ammeter used for instrumentation.	C214.2	1
Q.2.4.	Draw the circuit of basic DC voltmeter.	C214.2	1
Q.2.5.	State the purpose of shunt in the voltmeter.	C214.2	1
Q.2.6.	What is the principle of working of PMMC instruments? List the advantages and disadvantage of it.	C214.2	1
Q.2.7.	What are the advantages of digital instruments over analog instruments?	C214.2	1
Q.2.8.	What is the essential torque required for operating an instrument?	C214.2	1,2
Q.2.9.	How resisters and diodes are checked using digital multimeter?	C214.2	1,3
Q.2.10.	Why are the ordinary wattmeters not suitable for low power factor circuits?	C214.2	1
Q.2.11.	Define ratio error.	C214.2	1
Q.2.12.	Define creeping in energy meter. [4]	C214.2	1
Q.2.13.	Discuss in brief about the hysteresis in B-H curve.	C214.2	1
Q.2.14.	Explain with example, the term Hysteresis .	C214.2	1
Q.2.15.	List out the methods used for measurement of iron loss in ferromagnetic material.	C214.2	1
Q.2.16.	Classify different types of iron loss.	C214.2	1
Q.2.17.	What is the necessary precaution to be taken in CT?	C214.2	1
Q.2.18.	State any two applications of CT and PT.	C214.2	1
Q.2.19.	Define transformation ratio of an instrument transformer.	C214.2	
Q.2.20.	What are the different methods used for frequency measurement in power frequency range?	C214.2	1
Q.2.21.	What is phase sequence indicator?	C214.2	1
Q.2.22.	What is phase meter? List its types.	C214.2	1
Q.3.1.	What are the applications of potentiometer?	C214.3	1
Q.3.2.	How are AC potentiometers classified? List them.	C214.3	1
Q.3.3.	List the applications of DC potentiometer &self balancing potentiometer.	C214.3	1
Q.3.4.	Define the term standardization of a potentiometer.	C214.3	1
Q.3.5.	List the applications of AC bridge.	C214.3	1
Q.3.6.	List the various detectors used for AC bridges.	C214.3	1
Q.3.7.	Why there are two conditions of balance in AC bridge?	C214.3	1
Q.3.8.	With neat diagram, write the balanced equation of Wheatstone bridge. [2]	C214.3	1,2
Q.3.9.	With neat diagram, write the expression of L_x& R_x of Anderson bridge.	C214.3	1,2
Q.3.10.	How does Hay's bridge differ from Maxwell's bridge? What is its uniqueness?	C214.3	1,3
Q.3.11.	Write the balance condition for a Schering bridge	C214.3	1,2
Q.3.12.	What is meant by self balancing bridges? Give two examples.	C214.3	1
Q.3.13.	What is called volt-ratio box? [2]	C214.3	1
Q.3.14.	What is electromagnetic interference? What are the sources of it? [2]	C214.3	1
Q.3.15.	How a ground loop is formed? What is the use of earth loop?	C214.3	1
Q.3.16.	What is meant by grounding? Enumerate the principle of grounding.	C214.3	1

Q.3.17.	What are parasitic voltages and how are they eliminated?	C214.3	1,4
Q.3.18.	Which instrument is used for measuring very high resistance found in cable insulations?	C214.3	1,4
Q.3.19.	How the effect of stray capacitances could be reduced?	C214.3	1,4
Q.3.20.	Give the function of Wagner earth device.	C214.3	1,4
Q.3.21.	What is an isolation amplifier? Where is it used?	C214.3	1
Q.4.1.	What are the various components of a recording instruments?	C214.4	1
Q.4.2.	Explain briefly on magnetic tapes.	C214.4	1
Q.4.3.	List any two storage devices.	C214.4	1
Q.4.4.	What is the principle of digital encoder?	C214.4	1
Q.4.5.	Differentiate the function of printer and plotter.	C214.4	1
Q.4.6.	What is the principle of operation of an ink jet printer? [2]	C214.4	1
Q.4.7.	What are the various types of marking mechanisms in strip chart recorder?	C214.4	1
Q.4.8.	What are the types of printers according to printing methodology?	C214.4	1,7
Q.4.9.	What are the main parts of CRT?	C214.4	1
Q.4.10.	What is the function of signal conditioner?	C214.4	1
Q.4.11.	What is the purpose of a post deflection acceleration in a CRT?	C214.4	1
Q.4.12.	Distinguish between LED and LCD. [6]	C214.4	1,7
Q.4.13.	List the merits and demerits of LED & LCD.	C214.4	1,7
Q.4.14.	What is the principle of working of Dot Matrix display?	C214.4	1
Q.4.15.	Why today's commercial LED monitor have become more popular than their LCD counterparts.	C214.4	1,7
Q.4.16.	What is the function of data logger? Mention the role of it in instrumentation system.[4]	C214.4	1,7
Q.5.1.	What is transducer? How are classified? Give an example. [2]	C214.5	1
Q.5.2.	Define primary types of transducer.	C214.5	1
Q.5.3.	What is the difference between active transducer and passive transducer?	C214.5	1
Q.5.4.	What are the basic requirements of a transducer?	C214.5	1
Q.5.5.	What are the factors to be considered for selection of transducer? [3]	C214.5	1
Q.5.6.	What is the principle of operation of optical transducer? Give an example.	C214.5	1
Q.5.7.	What is known as thermocouple effect & how do you use it in a transducer?	C214.5	1
Q.5.8.	What is the difference between sensor and transducer? [3]	C214.5	1
Q.5.9.	Name some of the active transducer which are used in the temperature measurement.	C214.5	1
Q.5.10.	What are the classification of encoder?	C214.5	1
Q.5.11.	How are stain gauge used for pressure measurement?	C214.5	1
Q.5.12.	What is the principle of operation of resistive transducer?	C214.5	1
Q.5.13.	Define piezo electric effect. [2]	C214.5	1
Q.5.14.	List the types of ADC & DAC. [2]	C214.5	1
Q.5.15.	What is meant by resolution for ADC?	C214.5	1
Q.5.16.	What is the need of S/H circuit in ADC?	C214.5	1
Q.5.17.	Draw the block diagram of for 4 bit ADC.	C214.5	1
Q.5.18.	What is meant by quantization error?	C214.5	1
Q.5.19.	Define smart sensor. Give any two application of it.	C214.5	1
Q.5.20.	What is meant by DAS?	C214.5	1

5.Assignments.

Assignment : I

A.1.1.	A circuit was tuned for resonance by eight different students and the values of resonant frequency in KHz were recorded as 532, 548, 543, 535, 546, 531, 543 & 536. Calculate arithmetic mean, mean deviation, average deviation and standard deviation.	C214.1	1,2

A.1.2.	The expected value of the voltage across a resistor is 40V. However the measurement gives a value of 39 V. Calculate (i) absolute error, (ii) % error, (iii) relative accuracy (iv) % of accuracy.	C214.1	1,2
A.1.3.	The true value of a voltage is 100V. the values indicated by a measuring instruments are 104, 103, 105, 103 & 105 Volts. Find the accuracy & precision of the measurements.	C214.1	1,2
A.1.4.	A (0-25)A Ammeter has a guaranteed accuracy of 1percent of Full scale reading. The current measured by this instrument is 10A. Determine the limiting error in percentage.	C214.1	1,2
A.1.5.	The probable values of two resistors and their S.D are specified as R1=18.62Ω, S.D=0.025Ω, R2=74.48Ω, S.D=0.05Ω. find the probable values and S.D for the two resistors when they are connected in series and parallel.	C214.1	1,2
Assignment : II			
A.2.1.	A 100/5A CT having a rated burden of 25VA has an iron loss of 0.4W and a magnetizing current of 2A. calculate its ratio error and phase angle error when supplying rated output current to a meter having a ratio of resistance to reactance 5.	C214.2	1,2
A.2.2.	A PMMC ammeter gives reading of 40mA when connected across two opposite corners of a bridge rectifier, the other two corners of which are connected in series with a capacitor to 100KV, 50Hz supply. Determine the capacitance.	C214.2	1,2,3
A.2.3.	A 230V,1Φ watt-hour meter has a constant load of 4A passing through it for 6 Hrs at unity P.F. if the meter disc makes 2208 revolutions, during this period, what is the meter constant in revolution/kWh. Calculate the P.F of the load if the number of revolutions made by the meter are 1472 when operating at 230v, 5A for 4 Hrs.	C214.2	1,2
A.2.4.	A voltmeter uses 4 – ½ digit display. What is the resolution? How would the 11.87V be displayed on a 10V ranges? How would 0.5573 be displayed on 1V and 10V ranges?	C214.2	1,2
A.2.5.	A 11000 : 110, P.T is used along with a voltmeter reading 87.5V. Estimate the value of line voltage.	C214.2	1,2
Assignment : III			
A.3.1.	A simple slide wire is used for measurement of current in a circuit. The voltage drop across a standard resistor of 0.1Ω is balanced at 75cm. find the magnitude of the current if the standard cell emf of 1.45V is balanced at 50cm. [T1-461]	C214.3	1,2
A.3.2.	Calculate the inductance of a coil from the following measurement on an A.C potentiometer: voltage drop across a 0.1Ω standard resistor connected in series with the coil = 0.613∟12º6′. voltage drop across the test coil through a 100/1volt-ratio box = 0.781∟50º48′. frequency is 50Hz. [T1-473]	C214.3	1,2
A.3.3.	A 4 terminal resistor of approximately 50μΩ resistance was measured by means of a Kelvin bridge having the following component resistances: standard resistor = 100.03Ω, inner ratio arms = 100.31Ω & 200Ω; outer ratio arms = 100.24Ω & 200Ω; resistance of link connecting the standard and the unknown resistance = 700μΩ. Calculate the unknown resistance to the nearest 0.01μΩ. [T1-436]	C214.3	1,2
A.3.4.	Maxwell's capacitance bridge is used to measure an unknown inductance in comparison with capacitance. The values at balance, R2=400Ω, R3=600Ω, R4=1000Ω,C4=0.5μF. calculate the values of R1 & L1. Calculate also the value of storage Q factor of coil if frequency is 1000Hz. [T1-499]	C214.3	1,2,4

A.3.5	The arms of 5 node bridge are as follows: arm AB- unknown impedance R1,L1 in series with a non inductive variable resistor r1, arm BC – a non inductive resistor R3=100Ω, arm CD - a non inductive resistor R4=200Ω, arm DA - a non inductive resistor R2=250Ω, arm DE a non inductive variable resistor r , arm EC a loss-less capacitor C=1μF & arm BE-a detector. An AC supply is connected between A & C. calculate the resistance & inductance R1, L1, when under balance conditions r1=43.1Ω & r=229.7Ω.	C214.3	1,2,4
6.Seminar Topics.			
S.1	Industrial metering from different types of consumers & Industrial tariffs	C214.	7
S.2	Working of Beat frequency oscillator	C214.	7
S.3	HV measurements & Testing	C214.	7
S.4	Optoelectronic measurements	C214.	7
S.5	Potentiometers	C214.	7
S.6	Ohmmeters	C214.	7
S.7	Galvanometers	C214.	7
S.8	Flux meter	C214.	7
S.9	Megger	C214.	7
S.10	Power Factor meter	C214.	7
S.11	Synchroscopes	C214.	7
S.12	Function generator	C214.	7
S.13	Signal analysers	C214.	1,5
S.14	High frequency measurements	C214.	1
S.15	Q-meter	C214.	1
S.16	Instrumentation amplifier	C214.	1
S.17	Chemical sensors	C214.	5
S.18	Fibre optic measurements	C214.	5
S.19	Microprocessor based measurements	C214.	5
S.20	Units, Systems and Dimensions	C214.	1
S.21	IEEE488 standard	C214.	1
S.22	Data Transmission and Telemetry	C214.	1
S.23	Biomedical Instrumentation	C214.	5
S.24	Analytical Instruments	C214.	5
S.25	Electrical tachometer	C214.	1
	7. Self Study topic		
SS.1	The Significance of Energy Storagefor Renewable Energy Generation and theRole of Instrumentation and Measurement [IEEE Instrumentation & Measurement Magazine April 2014]	C214.	1,2,3, 4,7

Reg. No. | | | | | | | | | | | | |

Question Paper Code : 57511

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Fourth Semester

Civil Engineering

MA 6459 – NUMERICAL METHODS

(Common to Aeronautical Engineering, Electrical and Electronics Engineering, Instrumentation and Control Engineering, Electronics and Instrumentation Engineering, Instrumentation and Control Engineering, Geoinformatics Engineering, Petrochemical Engineering, Production Engineering, Chemical and Electrochemical Engineering, Textile Chemistry and Textile Technology Also common to Petrochemical Technology, Polymer Technology, Plastic Technology & Chemical Engineering and Also Sixth Semester Manufacturing Engineerings)

(Regulation 2013)

Time : Three Hours **Maximum : 100 Marks**

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. What is the condition for convergence in Fixed point Iteration method ?
2. Name the two methods to solve a system of linear simultaneous equations.
3. Construct a table of divided difference for the given data :

x :	654	658	659	661
y :	2.8156	2.8182	2.8189	2.8202

4. Write down the Newton's forward difference interpolation formula for equal intervals.
5. Write down the general quadrature formula for equidistance ordinates.
6. Write down the forward difference formulae to compute the first two derivatives at $x = x_0$.

7. Write down the improve Euler's formula for first order differential equation.

8. How many values are needed to use Milne's predictor-corrector formula prior to the required value ?

9. Write down the diagonal five point formula in the solution of elliptic equations.

10. Classify the partial differential equation :

$$\frac{\partial^2 u}{\partial x^2} - 2\frac{\partial^2 u}{\partial x\,\partial y} + \frac{\partial^2 u}{\partial y^2} = 0$$

PART – B (5 × 16 = 80 Marks)

11. (a) (i) Find the approximate root of $xe^x = 3$ by Newton's method correct to three decimal places. **(8)**

(ii) Using Gauss-Jordan method solve the given system of equations : **(8)**

$10x + y + z = 12,$

$2x + 10y + z = 13,$

$x + y + 5z = 7$

OR

(b) (i) Solve the following system of equations using Jacobi's iteration method. **(8)**

$20x + y - 2z = 17,$

$3x + 20y - z = -18,$

$2x - 3y + 20z = 25$

(ii) Using power method find the dominant eigen value and the corresponding eigen vector for the given matrix. **(8)**

$$A = \begin{bmatrix} 15 & -4 & -3 \\ -10 & 12 & -6 \\ -20 & 4 & -2 \end{bmatrix}$$

12. (a) (i) From the given table compute the value of sin 38°. **(8)**

x :	0	10	20	30	40
$\sin x$:	0	0.17365	0.34202	0.5	0.64279

(ii) Using Lagrange's formula find the value of $\log_{10}323.5$ for the given data : **(8)**

x :	321.0	322.8	324.2	325.0
$\log_{10}x$	2.50651	2.50893	2.51081	2.51188

OR

(b) (i) Find the cubic polynomial from the following table using Newton's divided difference formula and hence find f(4). **(8)**

x :	0	1	2	5
$y = f(x)$	2	3	12	147

(ii) Find the cubic splines for the following table :

x :	1	2	3
y :	–6	–1	16

Hence evaluate y(1.5) and y'(2).

13. (a) (i) Find the first and second derivatives of the function tabulated below at $x = 1.5$ **(8)**

x :	1.5	2.0	2.5	3.0	3.5	4.0
$f(x)$	3.375	7.0	13.625	24.0	38.875	59.0

(ii) Find the value of $\log 2^{1/3}$ from $\int_0^1 \frac{x^2}{1+x^3}\,dx$ using Simpson's $\frac{1}{3}$ rule with $h = 0.25$. **(8)**

OR

(b) (i) Evaluate $\int_1^2 \frac{1}{1+x^3}\,dx$ using Gauss 3 point formula. **(8)**

(ii) Evaluate $\int_0^{\pi/2}\int_{\pi/2}^{\pi} \cos(x+y)\,dxdy$ by using Trapezoidal rule by taking $h = k = \frac{\pi}{4}$ **(8)**

14. (a) (i) Using Taylor series method, compute the value of y(0.2) correct to 3 decimal places from $\frac{dy}{dx} = 1 - 2xy$ given that y(0) = 0. (8)

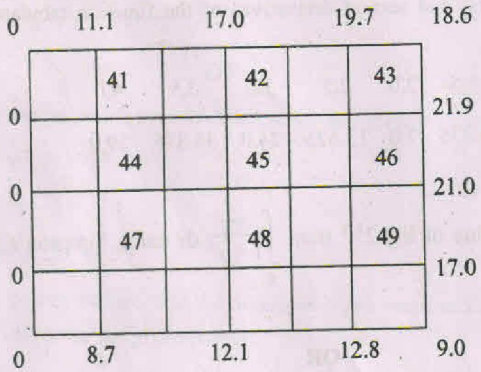
(ii) Using modified Euler's method, find y(0.1) and y(0.2) for the given equation $\frac{dy}{dx} = x^2 + y^2$, given that y(0) = 1. (8)

OR

(b) (i) Find the value of y(1.1) using Runge-Kutta method of 4th order for the given equation $\frac{dy}{dx} = y^2 + xy$; y(1) = 1. (8)

(ii) Using Adam's method find y(0.4) given that $\frac{dy}{dx} = \frac{xy}{2}$, y(0) = 1, y(0.1) = 1.01, y(0.2) = 1.022 y(0.3) = 1.023. (8)

15. (a) Solve the Laplace's equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ at the interior points of the square region given as below : (16)



OR

(b) Given that $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$, u(0, t) = 0, u(4, t) = 0 and $u(x, 0) = \frac{x}{3}(16 - x^3)$.

Find u_{ij} : i = 1, 2, 3, 4 and j = 1, 2 by using Crank-Nicholson method.

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 80612

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Fourth Semester

Civil Engineering

MA 6459 — NUMERICAL METHODS

(Common to Aeronautical Engineering, Electrical and Electronics Engineering, Instrumentation and Control Engineering, Electronics and Instrumentation Engineering, Instrumentation and Control Engineering, Geoinformatics Engineering, Petrochemical Engineering, Production Engineering, Chemical and Electrochemical Engineering, Textile Chemistry and Textile Technology)

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Derive a formula to find the value of $\sqrt{N}$, where N is a real number, by Newton's method.

2. Which of the iteration method for solving linear system of equation converges faster? Why?

3. Using Lagrange's interpolation formula find y value when $x = 1$ from the following data :

x :	0	−1	2	3
y :	−8	3	1	12

4. State Newton's forward formula and Backward formula.

5. Compare Trapezoidal rule and Simpson's 1/3 rule for evaluating numerical integration.

6. Change the limits of $\int_0^{\pi/2} \sin x \, dx$ into $(-1,1)$.

7. Compare Single-step method and Multi-step method.

8. Write down the Milne's predictor and corrector formulas.

9. Classify the following equation $u_{xx} + 4u_{xy} + 4u_{yy} - u_x + 2u_y = 0$.

10. Write down the standard five point formula.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Find a root of $x \log_{10} x - 1.2 = 0$ using Newton Raphson method correct to three decimal places.

(ii) Solve by Gauss Seidal method, the following system :

$20x + y - 2z = 17$, $3x + 20y - z = -18$, $2x - 3y + 20z = 25$.

Or

(b) (i) Find the dominant Eigen values of $A = \begin{bmatrix} 5 & 0 & 1 \\ 0 & -2 & 0 \\ 1 & 0 & 5 \end{bmatrix}$ using power method.

(ii) Apply Gauss Jordan method, find the solution of the following system :

$2x - y + 3z = 8$, $-x + 2y + z = 4$, $3x + y - 4z = 0$.

12. (a) (i) Find an approximate polynomial for $f(x)$ using Lagrange's interpolation for the following data :

x :	0	1	2	5
$y = f(x)$:	2	3	12	147

(ii) Find the value of y at $x = 21$ from the data given below :

x :	20	23	26	29
y :	0.3420	0.3907	0.4384	0.4848

Or

(b) (i) Given the tables :

x :	5	7	11	13	17
$y = f(x)$:	150	392	1452	2366	5202

Evaluate $f(9)$ using Newton's divided difference formula.

(ii) Fit a cubic spline from the given table :

x :	1	2	3
$f(x)$:	−8	−1	18

Compute $y(1.5)$ and $y'(1)$ using cubic spline.

13. (a) (i) The population of a certain town is shown in the following table.

Year :	1931	1941	1951	1961	1971
Population (in thousands) :	40.6	60.8	79.9	103.6	132.7

Find the rate of growth of the population in the year 1945.

(ii) Evaluate $\int_0^1 \frac{1}{1+x}\,dx$ using Romberg's method and hence find the value of $\log 2$.

Or

(b) (i) The velocity V of a particle at a distance S from a point on its path is given by the table.

S (ft) :	0	10	20	30	40	50	60
V (ft./sec) :	47	58	64	65	61	52	38

Estimate the time taken to travel 60 feet by using Simpson's $\frac{1}{3}$ rule.

(ii) Evaluate $\int_1^{1.4}\int_2^{2.4} \frac{1}{xy}\,dx\,dy$ using Trapezoidal rule by taking $h = k = 0.1$ and verify with actual integration.

14. (a) (i) Find the value of y at $x = 0.1$ from $\frac{dy}{dx} = x^2y - 1$, $y(0) = 1$ by Taylor's series method.

(ii) Solve $(1+x)\frac{dy}{dx} = -y^2$, $y(0) = 1$ by Modified Euler's method by choosing $h = 0.1$, find $y(0.1)$ and $y(0.2)$.

Or

(b) (i) Using Runge-Kutta method of fourth order, solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$, $y(0) = 1$ at $x = 0.2$.

(ii) Given $\frac{dy}{dx} = x - y^2$, $y(0) = 0$, $y(0.2) = 0.02$, $y(0.4) = 0.0795$ and $y(0.6) = 0.1762$. Compute $y(0.8)$ using Milne's method.

15. (a) (i) Using Bender Schmidt's method solve $u_t = u_{xx}$ subject to the condition, $u(0,t) = 0$, $u(1,t) = 0$, $u(x,0) = \sin \pi x$, $0 < x < 1$ and $h = 0.2$. Find the value of u up to $t = 0.1$.

(ii) Evaluate the pivotal values of the equation $u_{tt} = 16u_{xx}$ taking $h = 1$ upto $t = 1.25$. The boundary conditions are $u(0,t) = u(5,t) = u_t(x,0) = 0$ and $u(x,0) = x^2(5-x)$.

Or

(b) By Iteration method solve the elliptic equation $u_{xx} + u_{yy} = 0$ over the square region of side 4, satisfying the boundary conditions $u(0,y) = 0$, $0 \le y \le 4$, $u(4,y) = 12 + y$, $0 \le y \le 4$, $u(x,0) = 3x$, $0 \le x \le 4$, $u(x,4) = x^2$, $0 \le x \le 4$. By dividing the square into 16 square meshes of side 1 and always correcting the computed values to two places to decimals. Obtain the values of u at 9 interior pivotal points.

Reg. No. | | | | | | | | | | | | |

Question Paper Code : 57316

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Fourth Semester

Electrical and Electronics Engineering

EE6401 – ELECTRICAL MACHINES – I

(Regulations 2013)

Time : Three Hours **Maximum : 100 Marks**

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. State Ampere's Law.
2. Define Leakage Flux.
3. Define all day efficiency of a transformer.
4. What is Inrush current in a transformer ?
5. Define Co-energy.
6. What is meant by winding inductance ?
7. Compare Lap and Wave windings.
8. Draw various characteristics of D.C. shunt generator.
9. Draw speed-torque characteristics of DC series motor.
10. What is meant by Plugging ?

PART – B (5 × 16 = 80 Marks)

11. (a) Summarize the properties of magnetic materials. **(16)**

OR

(b) Explain the Hysteresis and eddy current losses and obtain its expression. **(16)**

12. (a) With a circuit explain how to obtain equivalent circuit by conducting O.C & S.C test in a single phase transformer. **(16)**

OR

(b) Explain the various three phase transformer connection and parallel operation of three phase transformer. **(16)**

13. (a) Obtain the expression for energy in a attracted armature relay magnetic system. **(16)**

OR

(b) With an example explain the Multiple-excited magnetic field system. **(16)**

14. (a) Explain the Armature Reaction in D.C machine. **(16)**

OR

(b) (i) Obtain EMF equation of D.C. generator. **(8)**

(ii) A 4-pole dc motor is lap-wound with 400 conductors. The pole-shoe is 20cm long and the average flux density over one-pole-pitch is 0.4T, the armature diameter being 30 cm. find the torque and gross-mechanical power developed when the motor is Drawing 25A and running at 1500 rpm. **(8)**

15. (a) The no-load test of a 44.76 kW, 220-V, D.C. shunt motor gave the following figures :

Input current = 13.25 A; Field current = 2.55 A; Resistance of the armature at 75°C = 0.032Ω and Brush drop = 2V. Estimate the full-load current and efficiency. **(16)**

OR

(b) Explain the method to obtain efficiency at full load by conducting Hopkinson's test. **(16)**

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 80373

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Fourth Semester

Electrical and Electronics Engineering

EE 6401 — ELECTRICAL MACHINES – I

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is Hysteresis Losses?
2. Define Flux Linkage.
3. Define Voltage Regulation of a transformer.
4. Draw Scott connection of a transformer.
5. What is Magnetic saturation?
6. What is meant by distributed winding?
7. Write EMF equation of D.C generator.
8. What is the use of Interpole in D.C machine?
9. List various method of starting D.C motor.
10. What is meant by dynamic braking in D.C motor?

PART B — (5 × 16 = 80 marks)

11. (a) Obtain the expression for Dynamically induced EMF and force. (16)

Or

(b) Explain the AC operation of Magnetic circuit. (16)

12. (a) The following data were obtained on a 20 kVA, 50 Hz, 2000/200 V distribution transformer:

	Voltage (V)	Current (A)	Power (W)
OC test with HV open-circuited	200	4	120
SC test with LV short-circuited	60	10	300

Draw the approximate equivalent circuit of the transformer referred to the HV and LV sides respectively. (16)

Or

(b) With circuit explain Sumpner's test and how to obtain efficiency of a transformer. (16)

13. (a) Obtain the expression for field energy and mechanical force. (16)

Or

(b) Explain about the Magnetic field in rotating machines. (16)

14. (a) Explain the construction and operation of D.C generator. (16)

Or

(b) Describe the process of commutation in D.C machine. (16)

15. (a) In a Hopkinson's test on a pair of 500-V. 100-kW shunt generators, the following data was obtained:

Auxiliary supply, 30 A at 500 V: Generator output current, 200 A Field currents, 3.5 A 1.8 A

Armature circuit resistances, 0.075 Ω each machine. Voltage drop at brushes, 2 V (each machine).

Calculate the efficiency of the machine acting as a generator. (16)

Or

(b) With a circuit, explain how to obtain efficiency of D.C Generator by conducting Swinburne's test. (16)

Reg. No. | | | | | | | | | | | | |

Question Paper Code : 57251

B.E/B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Fourth Semester

Electrical and Electronic Engineering

CS 6456 – OBJECT ORIENTED PROGRAMMING

(Common to Electronics and Instrumentation Engineering, Instrumentation and Control Engineering)

(Regulations 2013)

Time : Three Hours **Maximum : 100 Marks**

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. What is object oriented programming ?
2. Define data abstraction.
3. Distinguish between class and object.
4. What is the use of destructor ?
5. What is generic programming ?
6. What is meant by exception ?
7. What is byte code ?
8. Java is robust. Comment.
9. Distinguish between interface and class.
10. What is multithreading ?

PART – B (5 × 16 = 80 Marks)

11. (a) (i) List out differences between procedure oriented programming and object oriented programming.

(ii) Explain about pointers with an example. **(9 + 7)**

OR

(b) (i) Explain the characteristics of OOPs.

(ii) Write a C++ program to list out prime numbers between the given two limits. **(8 + 8)**

12. (a) (i) What are constructors ? Explain the concept of destructor with an example.

(ii) Explain array of objects with an example. **(8 + 8)**

OR

(b) (i) What is operator overloading ? List out the rules to overload a binary operator.

(ii) Write a C++ program to add two vectors using + operator overloading. **(7 + 9)**

13. (a) (i) What is Inheritance ? List out the advantages of Inheritance.

(ii) Write a C++ program to implement multiple inheritance. **(7 + 9)**

OR

(b) (i) Discuss about exception and its advantages.

(ii) Write a C++ program to generate an exception whenever user input is even number less than 100. **(5 + 11)**

14. (a) (i) List out the characteristics of JAVA.

(ii) Explain about dynamic method dispatch with an example. **(8 + 8)**

OR

(b) (i) Distinguish between instance methods and class methods with an example.

(ii) Implement a class Student. A Student has a name and a total quiz score. Supply an appropriate constructor and methods getName( ), addQuiz(int score), getTotalScore( ) and getAverageScore( ). To Compute the latter, you also need to store the number of quizzes that the student took. **(6 + 10)**

15. (a) (i) How to define an interface ? Why do the members of interface are static and final ?

(ii) Write a Java Program to implement nested packages. **(7 + 9)**

OR

(b) (i) Distinguish between arrays and strings.

(ii) Explain the methods available in the String Buffer class.

(iii) Explain the use of command line arguments with an example. **(3 + 5 + 8)**

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 80295

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Fourth Semester

Electrical and Electronic Engineering

CS 6456 — OBJECT ORIENTED PROGRAMMING

(Common to Electronics and Instrumentation Engineering, Instrumentation and Control Engineering)

(Regulations 2013)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is meant by Object Oriented Programming?
2. Define abstraction.
3. State the uses of inline functions.
4. Define polymorphism.
5. What are the advantages of generic programming?
6. What is an exception?
7. "Java is platform independent language". Comment.
8. Distinguish between overloading and overriding.
9. What is the use of multithreading?
10. Distinguish between class and interface.

PART B — (5 × 16 = 80 marks)

11. (a) (i) List out differences between procedure oriented programming and object oriented programming.

(ii) List out the applications of OOPs. (9 + 7)

Or

(b) (i) Explain the characteristics of OOPs.

(ii) Write a C++ program to list out the prime numbers between the given two limits. (8 + 8)

12. (a) (i) Explain function overloading in C++ with an example. (8)

(ii) What are constructors? Explain the concept of constructors and destructors with an example. (8)

Or

(b) (i) Write a C++ program to overload + operator to add two complex numbers. (8)

(ii) Explain the need for iterators using sufficient examples. (8)

13. (a) (i) Write a C++ program to generate user defined exception whenever user inputs odd numbers.

(ii) Explain function templates with an example. (9 + 7)

Or

(b) (i) Explain multiple inheritance in C++ with examples.

(ii) List out the advantages of generic programming. (10 + 6)

14. (a) (i) Highlight the features of Java. (6)

(ii) Explain the different looping constructs of Java with examples. (10)

Or

(b) Explain the types of inheritance in Java with examples. (16)

15. (a) (i) How do you add an interface to a package? Explain with an example. (8)

(ii) How exceptions are handled in Java? Explain the important methods used to handle exception. (8)

Or

(b) (i) Explain multithreading with an example. (8)

(ii) Explain any six methods available in the StringBuffer class. (8)

Reg. No. | | | | | | | | | | | | |

Question Paper Code : 57317

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Fourth Semester

Electrical and Electronics Engineering

EE 6402 – TRANSMISSION AND DISTRIBUTION

(Regulations 2013)

Time : Three Hours **Maximum : 100 Marks**

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. What are the advantages of high voltage power transmission ?
2. What are the objectives of FACTS ?
3. Define transposition of lines.
4. What is corona ?
5. Define Ferranti effect.
6. Mention the significance of surge impedance loading.
7. What are the tests performed on the insulators ?
8. Classify the cables used for three phase service.
9. Define sag.
10. What is meant by stringing chart ?

PART – B (5 × 16 = 80 Marks)

11. (a) (i) Explain the structure of electric power system. **(8)**

(ii) A two wire dc ring main distributor ABCDEA is fed at point A with 230V supply. The resistances of go and return conductors of each section AB, BC, CD, DE, AE are 0.1 ohm. The main supplies the loads of 10A at B, 20A at C, 10A at D, 30A at E. Find the voltage at each load point. **(8)**

OR

(b) (i) Explain the different types of FACTS controllers. **(8)**

(ii) Explain the different HVDC links. **(8)**

12. (a) Derive the expression for the capacitance of a three phase transmission line with unsymmetrical spacing. **(16)**

OR

(b) Determine the inductance per km of a double circuit 3Φ line as shown in Fig. Q. 12 (b). The transmission line is transposed within each circuit and each circuit remains on its own side. The diameter of each conductor is 15mm. **(16)**

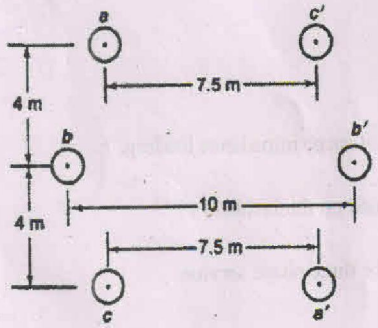


Fig. Q. 12 (b)

13. (a) A 3Φ, 50Hz, 100 km line has the following constants. Resistance/phase/km = 0.153 ohm, inductance/phase /km = 1.21mH, capacitance/phase / km = 0.00958 μF. If the line supplies a load of 20MW at 0.9 pf lagging at 110 kV at the receiving end calculate sending end current, sending end power factor, regulation and transmission efficiency using nominal T method. **(16)**

OR

(b) The constants of a three phase line are A = 0.9∟2° and B = 140∟70° ohms per phase. The line delivers 60 MVA at 132 kV and 0.8 pf lagging. Draw power circle diagrams and find (a) sending end voltage and power angle (b) the maximum power which the line can deliver with the above values of sending and receiving end voltages (c) the sending end power and power factor (d) line losses. **(16)**

14. (a) (i) Briefly explain the different methods to improve string efficiency of suspension type insulators. **(8)**

(ii) A three unit insulator string is fitted with a guard ring. The capacitances of the link pins to metal work and guard ring can be assumed to be a 15% and 5% of the capacitance of each unit. Determine voltage distribution and string efficiency. **(8)**

OR

(b) Explain the methods of grading of cables with neat diagrams and equations. **(16)**

15. (a) A transmission line has a span of 275 m betweeen level supports. The conductor has an effective diameter of 1.96 cm and weighs 0.865 kg/m. If the conductor has ice coating of radial thickness 1.27 cm and is subjected to a wind pressure of 3.9 gm/sq.cm of projected area. The ultimate strength of the conductor is 8060 kg.Calculate the sag if the factor of safety is 2 and weight of 1 c.c of ice is 0.91 gm. **(16)**

OR

(b) Explain the methods of neutral grounding. **(16)**

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 80374

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Fourth Semester

Electrical and Electronics Engineering

EE 6402 — TRANSMISSION AND DISTRIBUTION

(Regulations 2013)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define feeder and distributor.

2. State the applications of HVDC transmission.

3. What are the advantages of using bundled conductors?

4. What is skin effect?

5. State the condition for maximum power delivered and draw the power angle diagram.

6. Mention the various methods of voltage control in transmission lines.

7. What are the methods of improving string efficiency in line insulators?

8. Mention any four insulating materials used for underground cables.

9. What are the factors affecting sag in a transmission line?

10. What is the need for earthing?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain the effect of high voltage on volume of copper and on efficiency. (8)

(ii) Derive suitable expressions to determine the voltage drop and power loss in an uniformly loaded distributor of length 'l' fed at both ends with equal voltages. (8)

Or

(b) (i) Make a comparison between EHVAC and HVDC system based on economics. (8)

(ii) Explain the different HVDC links. (8)

12. (a) (i) Derive the expression for inductance of a three phase transmission line with unsymmetrical spacing. (8)

(ii) A 220 kV, 50 Hz, 200 km long transposed three phase line has its conductors on the corners of a triangle with sides 6 m, 6 m and 10 m. The conductor radius is 1.81 cm. Find the capacitance per phase per km of the line. (8)

Or

(b) Explain the formation of corona, critical voltages, corona loss, advantages, disadvantages and methods to reduce the effect of corona. (16)

13. (a) A 50 Hz, 3φ transmission 30 km long has a total series impedance of $(40 + j125)\,\Omega$ and shunt admittance of 10^{-3} mho. The load is 50 MW at 220 kV with 0.8 pf lag. Find the sending end voltage, current, power factor, efficiency and regulation using nominal π-method. (16)

Or

(b) Derive the expression for the real and reactive power flow through transmission lines. (16)

14. (a) (i) Explain different types of insulators. (8)

(ii) A string of five insulator units has mutual capacitance equal to 10 times the pin to earth capacitance, find voltage distribution across various units as the per cent of the total voltage across the string and string efficiency. (8)

Or

(b) A 2 km long 3 core, 3Φ cable has capacitance 0.5 μF/km between two conductors bunched with sheath and the third conductor. The capacitance between the conductors is also measured when bunched together and the sheath and found to be 0.75 μF/km. Determine

(i) Capacitance between phases

(ii) Capacitance between the conductor and the sheath

(iii) Effective per phase capacitance

(iv) Capacitance between two conductors connecting a third conductor to the sheath

(v) Charging current if the supply voltage is 11 kV, 50 Hz. (16)

15. (a) An OHL at a river crossing is supported from two towers of heights 30 m and 90 m above water level with the span of 300 m. The weight of the conductor is 1 kg/m and working tension is 2000 kg. Determine the clearance between the conductor and the water level midway between the towers. (16)

Or

(b) Explain the methods of neutral grounding. (16)

Reg. No. | | | | | | | | | | | | |

Question Paper Code : 57318

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Fourth Semester

Electrical and Electronics Engineering

EE 6403 – DISCRETE TIME SYSTEMS AND SIGNAL PROCESSING

(Common to Instrumentation and Control Engineering, Electronics and Instrumentation Engineering)

(Regulations 2013)

Time : Three Hours **Maximum : 100 Marks**

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. Determine if the system described by the equation $y(n) = x(n) + \frac{1}{x(n-1)}$ is causal or non-causal.

2. What is an Anti-Aliasing filter ?

3. Determine the Z-transform and ROC of the following finite duration signals
   (i) $x(n) = \{3, 2, 2, 3, 5, 0, 1\}$
   (ii) $x(n) = \delta(n - k)$

4. Compute the convolution of the two sequences
   $x(n) = \{2, 1, 0, 0.5\}$ and $n(n) = \{2, 2, 1, 1\}$

5. Draw the flow graph of a 4 point radix-2 DIT-FFT butterfly structure for DFT.

6. What are the applications of FFT algorithm ?

7. Obtain the cascade realization for the system function,

$$H(z) = \frac{\left(1+\frac{1}{4}z^{-1}\right)}{\left(1+\frac{1}{2}z^{-1}\right)\left(1+\frac{1}{a}z^{-1}+\frac{1}{4}z^{-2}\right)}$$

8. Mention the advantages of FIR filters over IIR filters.

9. What are the merits and demerits of VLIW architecture ?

10. What are the factors that influence the selection of DSP processor for an application ?

PART – B (5 × 16 = 80 Marks)

11. (a) (i) Determine if the signals, $x_1(n)$ and $x_2(n)$ are power, energy or neither energy nor power signals.

$x_1(n) = \left(\frac{1}{3}\right)^n u(n)$ and $x_2(n) = e^{2n} u(n)$. **(8)**

(ii) What is the input signal $x(n)$ that will generate the output sequence

$y(n) = \{1, 5, 10, 11, 8, 4, 1\}$ for a system with impulse response $h(n) = \{1, 2, 1\}$. **(8)**

OR

(b) (i) A signal $x(t) = \sin c(50\pi t)$ is sampled at a rate of (1) 20 Hz (2) 50 Hz and (3) 75 Hz. For each of these cases, explain if you can recover the signal $x(t)$ from the samples signal. **(6)**

(ii) Determine whether or not each of the following signals is periodic. If the signal is periodic, specify its fundamental period.

(1) $x(n) = e^{j6\pi n}$ **(5)**

(2) $x(n) = \cos\frac{\pi}{3}n + \cos\frac{3\pi}{4}n$. **(5)**

12. (a) (i) Find $x(n)$ if $X(z) = \dfrac{1 + \frac{1}{2}z^{-1}}{1 - \frac{1}{2}z^{-1}}$ **(6)**

(ii) Find the response of the causal system $y(n) - y(n-1) = x(n) + x(n-1)$ to the input $x(n) = u(n)$. Test its stability. **(10)**

OR

(b) Find the impulse response, frequency response, magnitude response and phase response of the second order system.

$$y(n) - y(n-1) + \frac{3}{16}y(n-2) = x(n) - \frac{1}{2}x(n-1).$$ **(16)**

13. (a) (i) Summarize the steps of radix – 2 DIT-FFT algorithm. **(8)**

(ii) Compute the 4 point DFT of the sequence $x(n) = \{0, 1, 2, 3\}$ using DIT and DIF algorithm. **(8)**

OR

(b) Find the IDFT of the sequence

$X(K) = \{4, 1 - j\,2.414, 0, 1 - j\,0.414, 0, 1 + j\,0.414, 0, 1 + j\,2.414\}$

Using DIF algorithm. **(16)**

14. (a) Design an ideal low pass filter with a frequency response

$$H_d(e^{jw}) = 1 \text{ for } \frac{-\pi}{2} \le w \le \frac{\pi}{2}$$

$$= 0 \text{ for } \frac{\pi}{2} \le |w| \le \pi$$

Find the values of $h(n)$ for $N = 11$. Find $H(z)$ and the filter coefficients. **(16)**

OR

(b) (i) Given the specifications $\alpha_p = 3$ dB, $\alpha_s = 10$ dB, $f_p = 1$ kHz and $f_s = 2$ kHz. Determine the order of the filter using Chebyshev approximation. Find $H(s)$. **(8)**

(ii) Apply bilinear transformation to

$H(s) = \dfrac{2}{(s+1)(s+2)}$ with $T = 1$ sec and find $H(z)$. **(8)**

15. (a) (i) Discuss on the addressing modes supported by a DSP processor. (8)

(ii) Design a DSP based system for the process of Audio signals in an audio recorder system. (8)

OR

(b) (i) Explain the datapath architecture and the bus structure in a DSP processor with suitable diagram. (8)

(ii) Elaborate on Radar signal processing using a DSP processor. (8)

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 80375

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Fourth Semester

Electrical and Electronics Engineering

EE 6403 — DISCRETE TIME SYSTEMS AND SIGNAL PROCESSING

(Common to Instrumentation and Control Engineering, Electronics and Instrumentation Engineering)

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Distinguish between discrete signal and digital signal representations.

2. If $x(n) = x(n+1)+x(n-2)$, is the system causal?

3. Find the system transfer function $H(Z)$ if $Y(n)=x(n)+y(n-1)$.

4. Explain the relationship between s-plane and z-plane.

5. Why is it required to do Zero padding in DFT analysis?

6. What is need for windowing techniques on Fourier Transformed signals?

7. Why are digital filters more useful than analog filters?

8. Name one method that convert the transfer function of a analog into the digital filter.

9. What is Gibbs Phenomena?

10. State how spectrum meter application can be designed with DS Processor.

PART B — (5 × 16 = 80 marks)

11. (a) With neat figure explain block diagram of a Digital Signal processing system. State the advantages of convolution technique. (14+2)

Or

(b) Distinguish the following with examples and formulae.

(i) energy vs power signal

(ii) time variant vs time invariant signal.

12. (a) (i) Explain the role of windowing to realize a FIR filter.

(ii) Compare and explain on the choice and type of windows selection for signal analysis.

(iii) Compute numerically the effect of Hamming windows and design the filter if

Cut-off frequency = 100 Hz. (6+6+4)

Sampling frequency = 1000 Hz.

Order of filter = 2

Filter length required = 5.

Or

(b) Evaluate the following :

(i) The impulse response $h(n)$ for $y(n)=x(n)+2x(n-1)-4x(n-2)+x(n-3)$

(ii) The ROC of a finite duration signal $x(n)=\{2,-1,-2,-3,0,-1\}$

(iii) Inverse Z-Transform for $X(z)=1/(z-1.5;)^4$; $ROC: |z|>1/4$.

13. (a) What is the need for frequency response analysis? Determine the frequency response and plot the magnitude response and phase response for the system.

$y(n)=2x(n)+x(n-1)+1y(n-2)$. (6+10)

Or

(b) Describe the need for Bit reversal and the Butterfly structure. For a sequence $x(n)=\{4,3,2,1,-1,2,3,4\}$ obtain the 8pt FFT computation using DIT method. (4+12)

14. (a) Write briefly on any TWO of the following : (8+8)

(i) Comparison of Butterworth and Chebyshev Filter

(ii) Elaborate one application of digital signal processing with a DS processor.

(iii) A difference equation describing a filter is given by $y(n)-2y(n-1)+y(n+2)=x(n)+\frac{1}{2}x(n-1)$ obtain direct form II structure.

Or

(b) Obtain the system function of the digital filter if the analog filter is $H_a(s)=1/\left[(s+0.2)^2+2\right]$. Using the impulse invariance method and the Bilinear Transformation method obtain the digital filter. (8+8)

15. (a) Compute the following if : $x_1=[-1,-1,-1,2]; x_2=[-2,-1,-1,-2]$ (10+6)

(i) Linear and circular convolution of a sequence

(ii) $x_1 ; x_2$ subject to addition and multiplication.

Or

(b) Write briefly an any 'TWO' of the following : (8+8)

(i) Quantisation and errors in DS processor

(ii) With neat figure explain the architecture of any one type of a DS processor.

(iii) The addressing modes of one type of DS Processor.

Reg. No. | | | | | | | | | | | | |

Question Paper Code : 57319

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Fourth Semester

Electrical and Electronics Engineering

EE 6404 – MEASUREMENTS AND INSTRUMENTATION

(Regulations 2013)

Time : Three Hours **Maximum : 100 Marks**

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. Name the dynamic characteristics of measurement systems.
2. What is meant by calibration of an instrument ?
3. Define creeping in energy meter ?
4. How are basic instruments converted into higher range ammeter ?
5. What is called a volt-ratio box ?
6. What is meant by grounding ?
7. Mention the role of Data loggars in Instrumentation system.
8. Distinguish between LED and LCD.
9. What are the factors to be considered for selection of transducers ?
10. List the types of Analog to Digital Converter ?

PART – B (5 × 16 = 80 Marks)

11. (a) (i) Explain the static characteristics of an instrument. **(10)**

(ii) Explain in detail the calibration technique. **(6)**

OR

(b) What are the different types of errors ? Explain how to eliminate errors in instruments. **(16)**

12. (a) With neat sketch, explain the construction and operation of repulsion type moving iron instrument. Give the advantages and limitations of such instruments. **(16)**

OR

(b) (i) Obtain B-H curve of ring specimen. **(8)**

(ii) Describe how to obtain iron loss of a ring specimen **(8)**

13. (a) Draw the diagram of Co-ordinate type A.C. potentiometer and explain its working principle. **(16)**

OR

(b) (i) Explain how the inductance is measured in terms of known capacitance using maxwell's bridge. Derive the conditions for balance. **(12)**

(ii) Why Hay's bridge is suited for measurement of inductance of high Q coils. **(4)**

14. (a) With neat diagram, explain the basic components and working principle of magnetic tape recorders. **(16)**

OR

(b) Describe the construction and working of LCDs. Mention the difference between light scattering and field effect types of LCDs, also explain the advantages of LCDs.

15. (a) Explain in detail about construction and working of LVDT. **(16)**

OR

(b) Explain smart sensors with built in features. Compare with conventional sensors. **(16)**

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 80376

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Fourth Semester

Electrical and Electronics Engineering

EE 6404 — MEASUREMENTS AND INSTRUMENTATION

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define static sensitivity.
2. What is the significance of calibration?
3. Write any four types of analog ammeter used for instrumentation.
4. Define transformation ratio of an instrument transformer.
5. How are AC potentiometers classified? List them.
6. What are the sources of Electromagnetic interference?
7. What is the principle of operation of an ink-jet printer?
8. What are the functions of data logger?
9. What are the basic requirements of a transducer?
10. Define piezo electric effect.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain the functional elements of an instrument with a neat block diagram. (10)

(ii) Explain the dynamic characteristics of an instrument in detail. (6)

Or

(b) A circuit was tuned for resonance by eight different students and the values of resonant frequency in KHZ were recorded as 532, 548, 543, 535, 546, 531, 543 and 536. Calculate (i) Arithmetic mean (ii) Deviation (iii) Average deviation (iv) Standard deviation.

12. (a) With circuit and phasor diagram, explain the working of single phase AC Energy meter.

Or

(b) Write a short notes on :

(i) Current Transformer. (8)

(ii) Weston frequency meter. (8)

13. (a) (i) Sketch the circuit of Wheatstone bridge, explain its operation and derive the equation for the unknown resistance. (10)

(ii) Explain Grounding technique. (6)

Or

(b) Write short notes on :

(i) Electrostatic interference. (8)

(ii) Electromagnetic interference. (8)

14. (a) With neat figure explain the working principle of a digital CRO. What are its advantages over analog CRO?

Or

(b) Explain the working of Dot matrix display. List its application.

15. (a) (i) Explain in detail, the working principle of piezoelectric transducers. (8)

(ii) Describe the different criteria for selection of transducer for a particular application. (8)

Or

(b) Explain Successive approximation type ADC with its characteristics.

ANNA UNIVERTISY, CHENNAI -25.

OFFICE OF THE CONTROLLER OF EXAMINATIONS

RULES OF THE EXAMINATIONS

A candidate is permitted to use geometric tools, non-programmable calculators and approved tables and data books only during the theory and the practical examinations. No other material/gadget (including cell phone) should be brought inside the examination hall.

A candidate should neither possess/refer any forbidden material in any form nor should seek/obtain assistance in any form from any person/source towards answering the questions during the examinations. He/she should not assist other candidates in any form towards answering the questions during the examinations. The candidate should not reveal his/her identity in any form in the answer scripts. The candidate should not indulge in canvassing either directly or indirectly to award more than deserving marks in the exanimations. The candidate should maintain discipline and decorum during the examinations.

Violation of the above rules in any form during the examinations will attract punishment ranging from levying fine to permanently debarring the candidate from continuing his/her studies as given below.

Sl.No.	Nature of Malpractice	Maximum Punishment
1	Appeal by the candidate in the answer script to show mercy by way of awarding more than deserving marks.	Fine of Rs. 1000/- per subject.
2	The candidate writing his/her name in the answer script.	
3	The candidate writing his/her registration number/college name in places other than specified in the answer script	
	Any special marking in the answer script by the candidate.	
4 5	The candidate communicating with neighbouring candidate orally or non-verbally; the candidate causing suspicious movement of his/her body.	
6	Irrelevant writing by the candidate in the answer script.	
7	The candidate marking on the question paper or writing answer on his/her question paper or making use of his/her question paper for rough work	
8	The candidate possessing cell phones/programmable calculator(s)/any other electronic storage device(s) **gadgets**	Invalidating the examination of the particular subject written by the candidate
9	The Candidate facilitating the other candidate(s) to copy from his /her answer script	
10	The candidate possessing any incriminating material(s) (whether used or not). For example:-Written or printed materials, bits of papers containing written information, writings on scale, calculator, handkerchief, dress, part of the body, Hall Ticket, etc.	Invalidating the examinations of the subject concerned and all the theory and the practical subjects of the
11	The candidate possessing cell phone(s)/programmable calculator(s)/any	

	and containing incriminating materials (whether used or not).	Further the candidate is not considered for revaluation of answer scripts of the arrears-subjects. If the candidate has registered for arrears – subjects only, invalidating the examinations of all the arrears – subjects registered by the candidate.
12	The Candidate possessing the question paper of another candidate with additional writing on it.	
13	The candidate passing his/her question paper to another candidate with additional writing on it	
14	The candidate passing incriminating materials brought into the examination hall in any medium (hard/soft) to other candidate(s).	
15	The candidate copying from neighbouring candidate.	
16	The candidate taking out of the examination hall answer booklet(s), used or unused	
17	Appeal by the candidate in the answer script coupled with a promise of any form of consideration.	
18	Candidate destroying evidence relating to an alleged irregularity.	Invalidating the examinations of the subject concerned and all the theory and the practical subjects of the current semester registered by the candidate. Further the candidate is not considered for revaluation of answer scripts of the arrears-subjects. If the candidate has registered for arrears – subjects only, invalidating the examinations of all the arrears – subjects registered by the candidate. **Additional Punishment:** 1. if the candidate has not completed the programme, he/she is debarred from continuing his/her studies for one year i.e., for two subsequent semesters. However the student is permitted to appear for the examination in all the arrears-subjects up to the last semester during the debarred period. 2. if the candidate has completed the programme, he/she is prevented from writing the examinations of the arrears-subjects for two subsequent semesters.
19	Vulgar/offensive writings by the candidate in the answer script.	Invalidating the examinations of all the theory and practical subjects of the current semester and all the arrears –subjects registered by the candidate.
20	The candidate possessing the answering script of another candidate	
21	The candidate passing his /her answer script to another candidate	
22	Involved in any one or more of the malpractices of serial no. 8 to 21 for the second or subsequent times.	Invalidating the examinations of all the theory and practical subjects of the current semester and all the arrears –subjects registered by the candidate. **Additional Punishment:** (i) If the candidate has not completed the programme, he/she is debarred from continuing his/her studies for one year i.e., for two subsequent semesters. However the student is permitted to appear for the examination in all the arrears-subjects up to the last semester during the debarred period. (ii) If the candidate has completed the programme, he/she is prevented from writing the examinations of the arrears-subjects for two subsequent semesters.
23	The candidate substituting an answer book let prepared outside the examination hall for the one already distributed to the candidate	
24	The candidate indulge in any disruptive conduct including, but not limited to, shouting, assault of invigilator, officials or students using abusive and /or threatening language, destruction of property.	Invalidating the examinations of all the theory and practical subjects of the current semester and all the arrears –subjects registered by the candidate. **Additional Punishment:** (i) if the candidate has not completed the programme, he/she is debarred from continuing his/her studies for **two years** i.e.,
25	The candidate harass or engage others to harass on his/her behalf an invigilator, official,	

	witnesses or any other person in relation to an irregularity by making telephone calls, visits, mails or by any other means.	for four subsequent semesters. However the student is permitted to appear for the examination in all the arrears-subjects up to the last semester during the debarred period. (ii) if the candidate has completed the programme, he/she is prevented from writing the examinations of the arrears-subjects for four subsequent semesters.
26	Candidate possessing any firearm/weapon inside the examination hall.	
27	Cases of Impersonation	(i)Handing over the impersonator to the police with a complaint to take appropriate action against the person involved in the impersonation by the Chief Supt. (ii)If a student of this University is found to impersonate a 'bonafide student', the impersonating student is debarred from continuing his/her studies and writing the examinations **permanently.** He/she is not eligible for any further admission to any programme of the University. (iii)Debarring the 'bonafide student' for whom the impersonation was done from continuing his/her studies and writing the examinations **permanently.** He/she is not eligible for any further admission to any programme of the University.

CONTROLLER OF EXAMINATIONS

K.L.N. COLLEGE OF ENGINEERING, Pottapalayam 630612
(11 km from Madurai City)

STUDENTS LEAVE APPLICATION FORM

Department of Electrical and Electronics Engineering

Date:

Name of the Student :

Roll No.: : Sem / Yr. / Sec.

No. of days, leave, already availed :

%of Attendance as on : _____ is _____

Date & Day :

Reason for Leave :

Signature of the Student **Name, Mobile No. & Signature of Parent / Guardian**

Recommended / Not Recommended

Class Tutor **Class Coordinator** **HOD/EEE**

K.L.N.COLLEGE OF ENGINEERING

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

ON DUTY REQUISITION FORM – STUDENTS –

TO ATTEND SKILL DEVELOPMENT PROGRAMMES (Workshop / Seminar / Symposium etc.)

Date: _____

To,

The Principal,
KLNCE.
Pottapalayam.

Respected Sir,

Sub.: Request for OD to attend _____

As, I am going to attend _____ conducted by _____ from_____ to_____.
Please permit me to attend the programme and also grant me O.D. for these days.

S. No	Roll No.	Name & Degree, Semester / Section)	No. of Programmes already attended & Days OD availed	No. of Arrears in AU Exam	No. of subjects failed in Class Test	No. of Subjects failed in CIT's	ATT % As on	Sign

Discipline / misbehavior, reported if any :

Clash with Internal test if any :

Recommended by		
Class co-ordinator	HOD	
	OD Permitted	OD Approved

K.L.N.COLLEGE OF ENGINEERING DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING On duty (OD) norms for students – Reminder

1. Students who apply for OD should submit the filled in OD form, forwarded by class co-ordinator, to the Department office. Such OD should be applied, **atleast a day before** availing it. Only after getting permission from the HOD, students are permitted to avail OD.

2. Students are permitted to **apply** for OD for attending co-curricular and extra curricular activities, inside / outside the college, only after getting prior permission from the class co-ordinator and HOD. Permission will be granted, considering students port folio, (performance in the University examination, Class test / CITs and attendance). Also the relevance of the seminar / workshop / technical events / certificate courses etc. will be reviewed with the class co-ordinators to sanction OD.

3. On duty will be approved only after the submission of relevant certificates (Copies to submitted to the staff in-charge, Mr. S. Rajalingam, and to the college office).

4. Final year Students having more than 6 arrears, third year students having more than 4 arrears and Second year students having more than 3 arrears (cumulative) will not be permitted to attend the Co-curricular / extra curricular activities. This is to ensure them to concentrate more on academic subjects. However, this will be relaxed, at the request of parents and students, considering the students contribution in the co –curricular / extra curricular activities.

5. Students who failed in 3 and above subjects in class tests / CITs will not be permitted to participate in any inside / outside the college co curricular activities. This is to ensure them to concentrate on academic subjects.

6. Students with less than 90% of attendance will not be permitted to apply for OD.

7. Students with the history of indiscipline activities reported in the past in the class room / laboratories / campus etc. will not be permitted to apply for OD.

8. Status of Students who have applied for OD for attending Co-curricular / extra curricular activities inside / outside the college will be monitored. Their presence in the concerned venue will be constantly monitored. Non availability of students, in the concerned venue, is reported, if any, disciplinary action will be taken.

9. First and Second year students of B.E-EEE are not encouraged to participate in the Co-curricular / extra curricular activities, as subject content of first and second year is heavy and basics are to be studied in deep for successful career.

10. Curricular / co-curricular events, are planned and periodically conducted by the department. Also certificate / certification courses are regularly conducted by the department during summer / winter holidays. Students are encouraged to attend such courses / events organized by the department, as it will not affect the regular academics.

11. Students are encouraged to attend curricular / co-curricular events, inside / outside the college, after college working hours or during holidays, as it will not affect the regular academics.

12. Students will be selectively permitted to attend curricular / co-curricular events inside / outside the college, if it is highly recommended by the faculty. A maximum of 10% of the students from each class will be permitted for attending such events. Preference will be given for those students having no history of arrears and passed all the class test / CITs.

13. Students attending curricular / co-curricular events inside / outside the college should maintain highest order of discipline. Indiscipline reports received, if any, students will not be permitted for attending any events thereafter and suitable disciplinary action will be taken.

14. It was reported that students who involved in indiscipline activities, while participating in the curricular / co-curricular activities, outside the college, were not permitted to appear for the University Examinations, as such issues reported to the University. Hence students should be very cautious while attending events inside / outside the college.

Co-operation of the all the staff are solicited for better academic performance and successful career.

HOD / EEE

A Brief History of The College

K.L.N. College of Engineering is the first self-financing Co-educational Engineering College in Madurai, started in 1994 by Munificence of Philanthropist and well wishers in Sourashtra Community which is a linguistic minority in Tamilnadu. This college is sponsored by the committee of eminent industrialists and academicians led by enthusiastic, educationalist and industrialist (Late) Thiru K.L.N. Krishnan. This college has the approval of All India Council for Technical Education, New Delhi and is affiliated to Anna University, Chennai.

Thiru. K.L.N. Krishnan, Founder President of this Engineering College has rendered Yeoman service to Sourashtra Arts & Science College and Sourashtra Girls Higher Secondary School, Madurai for the past several years. He also promited a Polytechnic under the name of K.L. Nagaswamy Memorial Polytechnic College in Viraganur, Madurai in 1983. This Engineering College, functioned in the premises of the above polytechnic during the academic years 1994-95 & 1995-96 was shifted to its own premises in the year 1996.

(Late) Thiru K.L.N. Krishnan is the Founder President, and the college is now under the management of Dr. K.N.K. Ganesh as Secretary & Correspondent and other executive committee members.

Campus :

This college is situated on the South Eastern outskirts of Madurai, 11th Km on Madurai – Nedungulam Road. It is built in an area of 53.8 acres. The Campus has multistoreyed buildings consisting of well provided class rooms, drawing halls, seminar halls, conference hall, library, Air-Conditioned Computer centres, staff rooms and student rest rooms. The infrastructure also consists of five double storeyed laboratory buildings and three single storeyed workshops and Machine shop, and an automobile workshop.

The Administrative block (2 storeyed) of 1,185 sq. metre with office in the ground floor, I.T. laboratory in the first floor & class rooms in the second floor has been constructed on the eastern side.

A two storeyed block of 1,185 sq. metre consisting class room has been constructed on the southern side of the administrative block.

A two storeyed block of 1,185 sq. metre with EIE laboratory in the ground floor, DSP laboratory in the first floor & class rooms in the second floor has been constructed on the western side of the administrative block.

A two storeyed block of 2,122 sq. metre with spacious library, video library & Electronic resource section in the ground floor, class rooms in the first floor & CSE laboratory in the second floor has been constructed near the administrative block.

A single storeyed block of 1,193 sq. metre with S.M. laboratory in the ground floor CAD, CAM laboratories in the first floor & class rooms in the second floor has been constructed on the north western side of the administrative block.

Three Mechanical sheds (occupied by three Mech. Engg. Laboratory) of 2460 sq. metre have been constructed on the northern side of the mechanical block. An automobile work shop of 2304 sq. metre has been constructed on the north western side of the administrative block.

An Indoor stadium cum Auditorium of 2,221 sq. metre has been constructed

on the northern side of the administrative block.

A separate double storeyed post-Graduate block of 4,020 square metre for M.B.A. and M.C.A. departments has been constructed on the South Western side of the administrative Block.

A single storeyed block of two canteens with 2,485 square metre in the ground floor and ladies rest room in the first floor has been contructed on the south western side of the Administrative Block.

A single storeyed block of 1,289 square metre for Electrical & Electronics Engg., Laboratories & class rooms in the ground floor and Electronics & Communication Laboratory and Class rooms in the first floor has been constructed on the western side of the Administrative Block.

A two-storeyed block with an area of 2,956 sq. metre has been constructed as an extension to Block III Opposite the U.G. library Block. This block comprised Physics lab, Chemistry lab and EIE Lab. D.S.P. Lab & Class rooms.

A two-storeyed block with an area of 2076 squre metre for the use of EEE Dept. in the ground floor & ECE Dept. in the first & 2nd floors is now under construction as an extension to the existing EEE & ECE block on the western side of the administrative block.

A two storeyed block with an area of 2,977 sq. metre for the use of Mechanical & Automobile depts. is now under construction, as an extension to the existing Mechanical block on the North-Western side of the administrative block.

A separate building with ground floor of area of 170 sq. metre for the installation of Generator on the South-estern side (Opposite to the Vinayagar temple) of the administrative block is under construction & (nearing completion)

In order to facilitate the easy accessibility for the students, in all, 950 numbers of computers have been installed so far. This sounds the management's conviction in providing essential infrastructure for the learning purpose in our college.

An overhead Tank of 20,000 Litre Capacity at a height of 40 feet has been constructed at a cost of Rs.4 lakhs, donated by Rotary international, Rotary District-1240, Rotary club of LEIGH-ON-SEA. Treated drinking water plant at a cost of Rs.2 lakhs has been installed near the overhead tank.

Well-furnished Men's Hostel, Mess block and canteen block are also inside the campus. The college is a quiet retreat, ideal for concentrated study, away from distractions and disturbances of a large city.

A single storeyed block of 1,330 square metre with a spacious dining hall in the ground floor and 13 rooms in the first floor for men students has been constructed on the northern side of the administrative block and is already in use. A two storeyed hostel block of 2,034 square metre adjacent to the existing hostel for men students has been constructed.

Total expenditure incurred so far towards the cost of equipments & buildings & other assets is about Rs.22.50 crores.

A VINAYAGAR Temple on the eastern side of the administrative Block has been constructed Eight class rooms for I year B.E. / B.Tech 2 class room for M.E. (P.S.) students, and two staff rooms have been constructed in the ECE/EEE block.

A Ladies Hostel of 1460 sq.m. which can accommodate about 150 students in under construction within the campus.

SALIENT FEATURES OF THE DEPARTMENT

1. GENERAL

- Started offering B.E. in Electrical and Electronics Engineering in the year 1994 with an intake of 40 (No.-732-50-8/RC/94, dated 11th August 1994, AICTE) with the latest intake of 120 in 2011 (F.No.Southern/1-400215781/2011/EOA, dated 01.09.2011, AICTE).
- Started offering M.E. in Power Systems Engineering in the year 2005 with an intake of 20 and increased intake to 24 in 2012 (F.No.Southern/1-687512981/2012/EOA, dated 10.05.2012, AICTE).
- Accredited in March 2004 (First time – F.No.NBA/ACCR-242/2003, dated 24/03/04) and Re-accredited (Second time – F.No.NBA/ACCR-242/2003, dated July 19, 2008) by National Board Accreditation, New Delhi.

  Re-accredited (Third time - For 2 years w.e.f. 28-08-2012) by National Board Accreditation, New Delhi.
- Recognized Research Centre No.4490408, Approved by Anna University, Chennai with effect from December 2012, offering guidance for M.S & Ph.D.(Full time/Part time).
- Both UG and PG programs are permanently affiliated to Anna University, Chennai with effect from December 2012.
- MODROB fund of Rs.5 lakhs was allotted for the year 2011-2012 for the Power Electronics laboratory (No.8024/RIFD/MOD-131(pvt)/Policy-III/2011-2012, dated 06.03.2012).

2. INFRASTRUCTURE

- Electrical machines laboratory, Control, Measurement and Instrumentation laboratory, Power Electronics laboratory, Electric circuits and Electronic devices laboratory, Research and Development laboratory and Power System Simulation Laboratory are equipped with machineries, components, signal generating, power supply measuring, recording instruments and computer systems costing Rs.2 crores. The total built up area of laboratories is 1208.21 sq.m.
- Latest softwares on Power system analysis, Power system stability, Power world simulator and Power electronics are available to study, solve, design and simulate research on Power system and Power Electronics problems to experience the real time results.
- All the class rooms are equipped with computer systems, LCD and OHP to promote the Teaching-Learning process more effectively.
- Separate library facility for EEE students with more than two thousand books on core subjects and hard copies of IEEE Journals and magazines from 1999 are available for reference. Staff and students can access the softcopy of Journals, proceedings published by IEEE, Elsevier, ASME, Springer, Mc Graw Hill.
- All laboratories are provided with sufficient computing facilities, printing facility with internet connection to simulate laboratory experiments.

3. STAFF

- Teams of well qualified, and experienced 32 faculties with cadre ratio as per AICTE, are guiding the students to attain the best educational objectives.
- Excellent research environment promotes the staff and students to participate, present and publish their research works in the National/International Journals and National/International conferences.
- Facility and experienced faculty available for guiding Ph.D. scholars.
- Staff development Programme / Faculty development programme / Workshop/ Seminar are organized regularly to share the knowledge of our experienced faculty with parent institution and other colleges staff and students and Industrial persons.

4. RESEARCH AND DEVELOPMENT

- The Research and Development section is doing research on Industrial Power Harmonics and mitigation and interact with industries in measuring, recording, analyzing and designing of filters for reducing harmonics with the help of Power Quality analyzer, as per IEEE standard.

5. STUDENTS

- Students secured 95 University Ranks in UG and 15 University Ranks in PG from 1998 to 2015 with **Goldmedal** in 2000 (UG - EEE) and in 2011 (PG–Power Systems Engineering). Sweety Jain of 2009 batchstudent secured 2nd rank in Anna University Examination in 2009 among 8500 students who completed degree and out of 240 Engineering colleges all over Tamil Nadu.
- IEEE student's chapter which was started in the year 1999, continuously conducting number of student technical programme. Guest lecturers from industries have been arranged periodically to promote Industry-Institute Interaction and to bridge the gap between curriculum and latest trend in industry.
- To promote innovation, latest trends in industry and employability skills, student's professional activities are conducted every year in the name of symposium and conferences.
- Workshop/Seminar is regularly conducted for students to meet out the curriculum objectives.
- Inplant trainings are arranged for second and third year students to have hands on training with industry. Industrial visits are arranged every semester to know about the various process taking places in industry.
- Placement oriented training programme were conducted every semester right from the first year to develop soft skills, attitude, aptitude, self confidence, communication skills, interview skills etc, so as to face the campus placement programme organized by the college. Professional Trainers from software companies, Bangalore, Chennai are being invited for such training programme.

K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM – 630 612

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

FACULTY LIST

S.No.	Name of the Faculty	Designation	Mobile No.	Email id
1.	Dr.S.M.Kannan	Professor & Head	9442035859	smkeeeklnce@gmail.com
2.	Dr.S.Venkatesan	Professor	9790672188	vensenn@yahoo.com
3.	Dr.K.Gnanambal	Professor	-	gnans_balu@rediffmail.com
4.	Dr. S.Parthasarathy	Professor	9443402901	sarathy_sps@yahoo.co.in
5.	Dr. S.Venkatanarayanan	Professor	9677320576	venjey@yahoo.co.uk
6.	A.Marimuthu	Associate Professor	9865002712	marimuthu_a@yahoo.com
7.	P.Loganthurai	Associate Professor	9952112115	loganthurai@yahoo.co.in
8.	M.Jegadeesan	Associate Professor	9524499063	m_jegadeesan07@rocketmail.com
9.	A.S.S.Murugan	Associate Professor	9344661182	assm17174@yahoo.co.in
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27.	V.Sindhu	Assistant Professor	-	savisindhu@yahoo.co.in
28.	R.Divya	Assistant Professor	-	divyaraajagopal@gmail.com
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31.	J.Sangeetha	Assistant Professor	-	geetha_maniraj@yahoo.com
32.	M.Maha Lakshmi	Assistant Professor	-	mmahalakshmi36@gmail.com
33.	Dr. C.Vimala Rani	Assistant Professor	-	jaysanjayvim@gmail.com

GENERAL REMINDERS

I. General

1. Keep at least 5 photocopies of birth certificate, ration card, Voters ID card, College ID card, Aadhar card, 10th ,+2 mark sheets, 10th /+2 Transfer Certificates,[* all proofs to be kept in your bag, in your house and in your mail, all kept in a water proof file-remember Chennai flood]. This will be required at anytime, anywhere.
2. Apply for Savings Bank account in any of the nationalized banks in first year. Apply for LIC schemes, saving schemes right from the first year. [*Refer]
3. Get Driving license during third year of your Degree course [*Refer]
4. Get Passport before the completion of 6th semester. [*Refer]
5. Always keep ID card issued by competent authority while moving from one city to another/one state to another. It is better to wear ID card always.(except during bathing).
6. Never share your username and password of mail accounts to anyone even in your home/ to teachers/ friends. Never reply to untrusted mail/fake messages. Never transfer/ deposit money to any unknown mail. Beware of fraud/cheating by any one.
7. Share only legal, ethical, non-political, educational, and value based information/ photos / videos with your friends or any others through social media. Posting of illegal/political/unethical/ information/comments will spoil your career. Remember that all such communications in social media/mails are continuously monitored and recorded by intelligent agencies in the country and abroad, due to security threats.
8. Don't involve teasing of students of your class, juniors or seniors in the classrooms, laboratories or in hostels. Don't loan the cell phone to anyone. Also don't keep your cell phone easily accessible by anyone.
9. Don't send obscene messages or pictures through cell phones/ internet to anyone. Defaulters will be easily tracked by Cyber Crime Agencies. Don't purchase/loan someone's laptop/mobile phone, due to theft complaints.
10. Avoid two wheeler riding for long travelling, and night travelling. Wear helmet. Follow traffic rules. Lot of accidental deaths reported due to negligence of traffic rules. About 1.5lakhs of people lost their life in accidents in our country every year.
11. For any transaction of money, use cheques or bank accounts (for more than Rs. 10,000/-) because finding fake notes is difficult.
12. Always keep 10 passport and stamp size photographs, 10 no.s of revenue stamps, all ID proofs whenever going for banks/pass port office.
13. Keep at least email ids and good friendship of 25 students of your branch who have been placed in different companies. Collect background information on core/IT companies (minimum 25)
14. Develop good reading habit/read News papers daily/watch news channel daily/Watch films nominated for Oscar award. Watch channels like Discovery/Nat Geo/History/ any other news channels.(not more than an hour)
15. Speak in English only. Develop good writing skills by reading books.
16. Have a Desk top/Laptop, Printer before entering 5th semester.
17. Have internet facility in home for educational purpose. Keep all NPTEL material.
18. Keep all kind of stationary in your table for use at any time[pencil, sharpener, eraser, ball point pen of different colours, sketches, bell clip, stapler, single punch, tag, gum, knife,scissors,A4 paper, cello tap, emergency lamp, scale, protractor, compass, pen drive, CD, whitener, calculator, diary, stapler pin box]

II. Education:

20. Download Anna University examination results immediately after the publication of result from AU website. Mark sheet attestation will not be given without the above copy.
21. Always keep 5 copies of AU mark sheets , of each semester. Post it on your mail.
22. Discrepancy in mark sheets such as Name, Date of Birth, and CGPA awarded, register number should be corrected immediately.

23. Always keep Rs 5,000/- in a semester for the payment of Book fee/AU exam fee/Training fee /purchase of competitive exam books/Educational tour/seminar/ additional course/ certification course etc. Educate your parents for the above. This may be required in a particular month or in several months spread in a semester.
24. Enroll in IEEE membership during first/second year. Attend at least one programme at Chennai.
25. Collect 5 sets of AU question papers, subject wise, in a semester (within 10 days)
26. Prepare good quality Resume. Consult TPO, placed final year students. Resume preparation is an art that ensures your quality and getting jobs in reputed concern. Update your resume, monthly (by attending value added courses, online courses, co-curricular and extracurricular activities, publishing articles in conferences, symposium, technical events, journals, News papers, inplant training, internship, new languages learnt, project developed, industrial visits, social services participated etc.)
27. Attend any courses after consulting with HOD/senior staff to avoid courses not suited to your branch.
28. Purchase text/reference books every semester.
29. Purchase competitive exam books, like Objective type QB, GATE/TANCET/IES/IAS and prepare for the exams from second year onwards.
30. Collect aptitude/reasoning/analytical/numerical/verbal/test questions from the placed students or download from the website. For successful placement, preparation from the first year in the above topics is required.
31. Collect information like Product, clients, branches, head office, annual turnover, GM,CEO, etc of 25 core companies, and 25 software companies.
32. Attend atleast one seminar/workshop/ paper presentation contest per semester, applicable to your branch of study.
33. Plan your study for current subject/assignment work/observation work/record work/aptitude training for technical /non-technical daily/weekly/monthly.
34. Decide & justify clearly, your objective before 6th semester and plan accordingly. Options are placement (ON/OFF) in core/IT companies, higher studies/ civil services, parents business, start your own business. Confused mind never take a decision.
35. Attend inplant training (Min: one week, Max: One month) during semester holidays. Avoid industrial visit (Energy waste) and educational tour (Money waste).
36. Do mini project in second, third year of your study .Update these in final year. Project should be based on the need of the society/industry.

III. Health

37. Health is wealth. Read Dalai Lama statement on life of a man. We work hard, earn and save money sacrificing our health. Later we spent lot of money for medical treatment due to poor healthcare.
38. Have regular exercise either in the forenoon/evening. (An hour walk is must everyday).
39. Your food habits decide what you are and how long you will live with peace. Avoid junk foods/road side eatery. Use hot water for drinking.
40. Consult doctors in case of health problems. Periodical medical checkup, once in 6 months, is necessary for health and dental care. This may require Rs.2, 000/- per year. Otherwise you need to pay a lot. It is advisable to stay in a house, within 500 meter (walk able distance) from a multispecialty hospital, otherwise 250 meters from any hospital. This is required to tackle emergency situations and also to avoid paying more for transport.
41. Avoid roaming/walking during summer/rainy season.
42. Attend yoga classes/ do meditation.
43. Apply group insurance medical policy at the age of 20.
44. Follow ethics and be Nationalistic.

Placement Activity – Reminder

1. In the month of October every first year students must fill forms online in TATA CONSULTANCY SERVICES (TCS) campus recruitment using **nextsteptcs.com** website and must submit the following documents in the department.
   a. SSLC and HSC mark sheet photo copy at least 5.
   b. Latest passport size Photo at least 5.
   c. Current address proof with parent contact cell numbers.
   d. Create your own two E-mail id using Gmail.
   e. Resume with Scanned copy of passport size Photo.
   f. CT number registered in the TCS website.
2. Every semester end update CGPA in your resume and TCS profile.
3. An Engineering student from Electrical and Electronics Engineering should complete the following courses in order to enhance their software skills. This will be most helpful during their successful completion in Curriculum during 4th Semester and in the software company campus recruitment.
   a. Should complete **C Programming** before joining **2nd Semester**.
   b. Should complete **C++ Programming** before joining **3rd Semester**.
   c. Should complete **JAVA Programming** before joining **4th Semester**. (for the successful completion of object oriented Programming theory paper and laboratory during 4th Semester)
4. An Engineering student from Electrical and Electronics Engineering should complete the **Micro Processor, Micro Controller and Embedded Systems** courses before joining **5th Semester** in order to enhance their Hardware skills. This willbe most helpful during their successful completion in Curriculum from 5th to 6th Semester and in the Core company campus recruitment. (for the successful completion of Micro Processor and Micro Controller theory as well as laboratory during 5th Semester and Embedded Systems during 6th Semester)
5. From 6th Semester Summer vacation onwards all should prepare for GATE Examination because all Engineering students from Electrical and Electronics Engineering should appear GATE Examination in order to settle in their life by pursuing higher education in the reputed colleges like IIT, NIT and Anna University or else to join as a Graduate Engineer trainee in a public sector companies like IOC, BHEL, PGCI etc.,
6. Before joining 7th Semester all should get any international certification programme course like OCJP, CCNA, etc., and upload the certification details in TCS campus commune website. This will be most helpful during the TCS campus and other MNC company recruitment.

Activity	Semester							
	1	2	3	4	5	6	7	8
TCS Online form Filling in nextsteptcs.com	In the month of October							
Documents to be submitted in the EEE Department/ Placement Coordinator	a. SSLC and HSC mark sheet photo copy at least 5. b. Latest passport size Photo at least 5. c. Current address proof with parent contact cell numbers. d. Create your own two E-mail id using Gmail. e. Resume with Scanned copy of passport size Photo. f. CT number registered in the TCS website.							
Updating CGPA in resume and TCS online profile	✓	✓	✓	✓	✓	✓	✓	✓
C Programming	✓	✓						
C++ Programming		✓						
JAVA Programming			✓					
Micro Processor & Micro Controller				✓				
Embedded Systems					✓			
GATE / UPSC/ TNPSC Preparation			✓	✓	✓	✓	✓	
International Certification – OCJP / CCNA						✓	✓	

K.L.N. COLLEGE OF ENGINEERING

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

All India Installed Capacity (in MW) of Power Stations

This is a **list of states and territories of India by installed capacity of power utilities** with electricity generation mode break-up as on **31 March 2016** with figures in Megawatts.

REVISED

INSTALLED CAPACITY (IN MW) OF POWER UTILITIES IN THE STATES/UTS LOCATED IN SOUTHERN REGION

INCLUDING ALLOCATED SHARES IN JOINT & CENTRAL SECTOR UTILITIES

(As on 31.03.2016)

State	Ownership/ Sector	Modewise breakup							Grand Total
		Thermal				Nuclear	Hydro (Renewable)	RES (MNRE)	
		Coal	Gas	Diesel	Total				
Andhra Pradesh	State	3085.91	0.00	0.00	3085.91	0.00	1758.87	89.50	4934.28
	Private	2990.00	3182.65	16.97	6189.62	0.00	0.00	2586.80	8776.42
	Central	1473.30	0.00	0.00	1473.30	127.16	0.00	0.00	1600.46
	Sub-Total	**7549.21**	**3182.65**	**16.97**	**10748.83**	**127.16**	**1758.87**	**2676.30**	**15311.17**
Telangana	State	4806.59	0.00	0.00	4806.59	0.00	2135.66	0.00	6942.25
	Private	270.00	1697.75	19.83	1987.58	0.00	0.00	605.54	2593.12
	Central	1721.88	0.00	0.00	1721.88	148.62	0.00	0.00	1870.50
	Sub-Total	**6798.47**	**1697.75**	**19.83**	**8516.05**	**148.62**	**2135.66**	**605.54**	11405.87
Karnataka	State	4220.00	0.00	127.92	4347.92	0.00	3599.80	155.33	8103.05
	Private	2060.00	0.00	106.50	2166.50	0.00	0.00	4950.19	7116.69
	Central	1628.46	0.00	0.00	1628.46	475.86	0.00	0.00	2104.32
	Sub-Total	**7908.46**	**0.00**	**234.42**	**8142.88**	**475.86**	**3599.80**	**5105.52**	**17324.06**
Kerala	State	0.00	0.00	234.60	234.60	0.00	1881.50	138.92	2255.02
	Private	0.00	174.00	0.00	174.00	0.00	0.00	116.55	290.55
	Central	1038.69	359.58	0.00	1398.27	228.60	0.00	0.00	1626.87
	Sub-Total	**1038.69**	**533.58**	**234.60**	**1806.87**	**228.60**	**1881.50**	**255.47**	**4172.44**
Tamil Nadu	State	4770.00	524.08	0.00	5294.08	0.00	2182.20	122.70	7598.98
	Private	2350.00	503.10	411.66	3264.76	0.00	0.00	9388.56	12653.32
	Central	4155.10	0.00	0.00	4155.10	986.50	0.00	0.00	5141.60
	Sub-Total	**11275.10**	**1027.18**	**411.66**	**12713.94**	**986.50**	**2182.20**	**9511.26**	**25393.90**
NLC	State	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Private	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Central	100.17	0.00	0.00	100.17	0.00	0.00	0.00	100.17
	Sub-Total	**100.17**	**0.00**	**0.00**	**100.17**	**0.00**	**0.00**	**0.00**	**100.17**
Puducherry	State	0.00	32.50	0.00	32.50	0.00	0.00	0.00	32.50
	Private	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.03
	Central	249.32	0.00	0.00	249.32	52.78	0.00	0.00	302.10
	Sub-Total	**249.32**	**32.50**	**0.00**	**281.82**	**52.78**	**0.00**	**0.03**	**334.63**
Central - Unallocated		1523.08	0.00	0.00	1523.08	300.48	0.00	0.00	1823.56
Total (Southern Region)	State	16882.50	556.58	362.52	17801.60	0.00	11558.03	506.45	29866.08
	Private	7670.00	5557.50	554.96	13782.46	0.00	0.00	17647.67	31430.13
	Central	11890.00	359.58	0.00	12249.58	2320.00	0.00	0.00	14569.58
	Grand Tota	**36442.50**	**6473.66**	**917.48**	**43833.64**	**2320.00**	**11558.03**	**18154.12**	**75865.79**

'*'Renewable Energy Sources (RES) includes small hydro projects, wind, solar, tidal, biomass and urban & industrial waste power.

ADVANCED TRAINING INSTITUTE

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Annual Training calendar 2016 – 2017

(Short Term Skill Training Programme)

	Course Code	Course Title	Duration (Week)	Date	
				From	To
GROUP:1		**ELECTRICAL CONTROL MAINTENANCE**			
	01.01	Protective Relays , Circuit Breakers, & Switch Gear Protection	01	04-04-2016	06-04-2016
				09-05-2016	13-06-2016
				20-06-2016	24-06-2016
				06-06-2016	12-06-2016
				12-09-2016	16-09-2016
				24-10-2016	28-10-2016
				19-12-2016	23-12-2016
				06-02-2017	10-02-2017
				13-03-2017	17-03-2017
	01.02	Operation and Maint. Of Power Transformers	01	11-04-2016	15-04-2016
				16-05-2016	20-06-2016
				27-06-2016	01-07-2016
				01-06-2016	05-06-2016
				29-08-2016	02-09-2016
				31-10-2016	04-11-2016
				05-12-2016	09-12-2016
				26-12-2016	30-12-2016
				13-02-2017	17-02-2017
				20-03-2017	24-03-2017
	01.03	Trouble shooting & Maintenance of Electric Motors	01	25-04-2016	29-04-2016
				23-05-2016	27-06-2016
				11-07-2016	15-07-2016
				19-09-2016	23-09-2016
				17-10-2016	21-10-2016
				07-11-2016	11-11-2016
				02-01-2017	06-01-2017
				20-02-2017	24-02-2017
	01.04	Operation & Control of Industrial AC/DC Motors	01	2-05-2016	5-05-2016
				30-05-2016	3-06-2016
				13-06-2016	17-06-2016
				15-07-2016	22-07-2016
				25-09-2016	30-09-2016
				21-11-2016	25-11-2016
				09-01-2017	13-01-2017
				27-02-2017	03-03-2017
	01.05	Electrical Safety at Work Place and First Aid	01	2-05-2016	6-05-2016
				5-05-2016	10-06-2016
				25-07-2016	29-07-2016
				3-10-2016	7-10-2016
				25-11-2016	02-12-2016
				16-01-2017	20-01-2017
				06-03-2017	10-03-2017
GROUP:1		**ELECTRONIC CONTROL MAINTENANCE**			
	02.01	Maintenance and Servicing of SMPS Inverter & UPS	02	11-07-2016	22-07-2016
				2-1-2017	13-1-2017
	02.02	Power Electronics and its Industrial Applications	02	4-04-2016	15-04-2016
				26-9-2016	7-10-2016
				27-2-2017	10-3-2017
	02.03	Industrial Drives & Automation using Siemens PLC	02	16-05-2016	27-05-2016
				6-5-2016	19-5-2016
				23-1-2017	3-2-2017
	02.04	Siemens S 7 400 PLC Step 7 (Level 1)	01	25-04-2016	29-04-2016
				29-5-2016	2-9-2016
				6-2-2017	10-2-2017
	02.05	Siemens S 7 400 PLC Win CC SCADA (Level 2)	01	2-05-2016	5-05-2016
				5-09-2016	9-09-2016
				13-02-2017	17-02-2017
	02.06	Siemens S 7 400 PLC TIA portal (Level 1)	01	16-05-2016	20-05-2016
				27-05-2016	1-07-2016
				3-05-2016	12-08-2016
				23-1-2017	27-1-2017
				28-11-2016	2-12-2016

List of PSUs through GATE Exam

Name of PSU	Eligible Branches	Name of PSU	Eligible Branches	Name of PSU	Eligible Branches
ONGC Ltd.	XE, GG	MDL	ME, EE	NLC	ME, EE, EC, IN, MN, CE
NHPC Limited	EE	PSPCL Ltd	ME, EE, EC, IN, CE, CS	NALCO	ME, EE, EC, IN, MT, CE, MN, CS, CH
BPCL Limited	ME, EE, CH, IN, CE	OPGC Ltd	ME, EE, CE, C & I	RITES	CE, ME
CEL	EC, ME, EE, XE	IRCON International Ltd	EC, EE, IN	NPCCL	CE
Coal India Ltd.	ME, EE, MN, GG	BNPM	ME, EE, EC, CH	MECL	ME, CY, GG
POWERGRID	EE, CE, CS	AAI	EC, EE	NBCC Ltd.	CE
Indian Oil	CH, CE, CS, EE, EC, GG, IN, ME, MT, MN	BBNL	EC, EE, CS	PAPCL	EE, EC, ME, IN, CS
THDC India Ltd	ME, EE, CE	NFL	EE, CS, CH, IN, XE		
HPCL	ME, EE, CE, IN, CH, EC	GSECL	EE, ME, MT, C & I		
NTPC Limited	ME, EC, EE, IN	GAIL	ME, EE, IN, CH		

Lists of TOP 10 software companies to offer jobs in India

S. No.	Name of the Company	About the company	Head quarters	Revenue	No. of Employees	Website
1.	**Tata Consultancy Services**	TCS was established in 1968 and is spread across 47 countries.	Mumbai, India	US$ 13.44 billion	300,464	www.tcs.com
2.	**Cognizant Technology Solutions**	CTS was founded in year 1994 by Srilankan American Kumar Mahadeva.	Teaneck, New Jersey, United States	US$ 8.84 billion	178,000	www.cognizant.com
3.	**Infosys**	Infosys was founded in year 1981.	Bangalore, Karnataka	US$ 8.4 billion	160,405	www.infosys.com
4.	**Wipro**	Azim Premji is the Chairman & TK Kurien is the CEO of Wipro.	Mumbai, India	US$7.3 billion	146,053	www.wipro.com
5.	**Tech Mahindra**	Tech Mahindra was founded in year 1986	Mumbai	$4.09 billion	89,500	www.techmahindra.com
6.	**HCL Technologies**	HCL was founded by Shiv Nadar in year 1991.	Noida, Uttar Pradesh	US$335 million	90,190	www.hcltech.com
7.	**iGate**	iGate was earlier known as Patni Computer Systems and was founded by Narendra Patni and his wife.	Bridgewater, New Jersey, U.S	US$ 1.15 billion	31,000 +	www.igate.com
8.	**Mphasis**	MPhasis was founded by Jaithirth Rao in year 2000	Bangalore, India	US$1.0 billion	45,426 +	www.MphasiS.com
9.	**Larsen &Toubro Infotech**	L & T Infotech was founded in year 1997	Mumbai	US$ 650 million	16,000+	www.lntinfotech.com
10.	**Oracle Financial Services Software Limited**	Oracle Financial Services Software Limited was earlier know as i-Flex Solutions Limited. It is spread across 130 countries around the globe and provides the IT solutions to the financial companies.	Mumbai, India	US$610 million	9,682	www.oracle.com

Lists of TOP 10 core companies to offer Electrical jobs

1 | Bharat Heavy Electricals Ltd.
Corporate office –New Delhi, India | **Establishment** –1964 |
Business –Electrical equipments | **Website** –*www.bhel.com*|

Bharat Heavy Electricals Ltd established in the year 1964 is a leading power plant equipment manufacturer and has expertise in engineering, manufacture, construction, testing, designing and servicing of various products of the core sectors such as defense, power, industries etc. BHEL is among the top electrical companies in India and which has total 16 manufacturing divisions and four regional offices. It is currently operating more than 150 project sites across India and abroad.

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2 | Alstom
Corporate office –Levallois-Perret, France | **Establishment** –1928 |
Business –Power generation and transmission | **Website** –*www.alstom.com*|

Alstom a multinational corporation is one of the best electrical companies in India and world, operating in hydroelectric power transportation and generation and it is active in many core industry sector. Company has a workforce of 9000+ employees in India and over 85000+ worldwide.

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3 | ABB
Corporate office –Zürich, Switzerland | **Establishment** –1988 |
Business –Electrical equipments | **Website** –*www.abb.com*|

ABB holds interests in robotics and mainly in the automation and power areas. ABB is active in the field of electricity grids manufacturing and other technologies in the field of automation and power. ABB is one of the few giant electrical player at global level and among the largest engineering company in the world.

4| Siemens
Corporate office –Erlangen, Germany | **Establishment** –1847 |
Business –Renewable energy, Power generation & transmission| **Website** –*www.energy.siemens.com*|

Siemens a German conglomerate is rated one the finest electrical company in India. Company's product line includes generators, steam turbines, compressors, high-voltage switching products and many more. Siemens employees more than 86000 people worldwide and it is a leading supplier of energy related products worldwide.

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5 | Crompton Greaves
Corporate office –Mumbai, Maharashtra | **Establishment** –1878 |
Business –Electrical | **Website** –*www.cgglobal.com*|

Crompton Greaves is a part of Avantha Group which is headquartered in Mumbai. CGL deals in manufacturing, marketing and designing of power transmission and generation related products. CGL has manufacturing units in Canada, France, Hungary, UK, US, Indonesia, Ireland, India and Belgium.

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6 |Bajaj Electricals Ltd.
Corporate office –Mumbai, Mharashtra | **Establishment** –1938 |
Business –Electrical Appliances | **Website** –*www.bajajelectricals.com*|

Bajaj Electricals is a leader in the field of electrical equipment and headquartered in Mumbai. It is one of the top 5 electrical companies in India having 19 branch offices across India. Bajaj Electricals provides complete range of consumer durable such as fan, electrical appliances, lighting which includes tubes, lamps etc.

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7 | Eason Reyrolle
Corporate office –Bangalore, Karnataka | **Establishment** –1986 |
Business –Electric Equipments & Industrial Consumables | **Website** –*www.easunreyrolle.com*|

Established in 1980 Easun Reyrolle is a Power Management Products, Transmission, Distribution & Industrial Application, Systems, Solutions and Services provider having significant presence in global market as reputed electrical products manufacturer.

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8 | Schneider Electrical
Corporate office –Rueil Malmaison, France | **Establishment** –1981 |
Business –Electric Equipment | **Website** –*www.schneider-electric.co.in*|

Schneider Electric a French company established in the year 2000 is among the top electrical companies in India which is involved in energy management. Company has a workforce of more than 17000 employees and has 31 global manufacturing Plants.

9| Wipro Lighting
Corporate office –Pune, Maharashtra | **Establishment** –|
Business –Lamps, Luminaires and Accessories | **Website** –*www.wiprolighting.com*|

Wipro lightings a part of Wipro group and a leading electrical company in India producing Lamps, luminaries and accessories. Company's product portfolio comprises of high end lighting control and architectural dimming system, high intensity discharge lamp Luminaries, brightness management lighting products etc.

10| Kelvin Electrical
Corporate office –Al-Ain, U.A.E | **Establishment** –2005 |
Business –| **Website** –*www.kelvin-electrical.com*|

Kelvin Electrical LLC founded in 2005 is based in United Arab Emirates (UAE). Kelvin Electrical deals in Cable Management Systems, Interior, Architectural, Exterior and Special lighting, Cable Support Systems, Raised Floor, Wiring Accessories etc.

K.L.N. COLLEGE OF ENGINEERING

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Lists of core companies to offer Electrical jobs in India

Types of Electrical Core Companies

1. Electrical motors and Generators
2. Consultancy (Electrical Engineering)
3. Electrical appliances
4. Electrical components companies
5. Lighting & luminaries
6. Power Generation
7. Electric wires & Cables
8. Electrical exporters
9. Measurements & Instrumentation
10. Power Distribution
11. Transformers
12. Green Energy Companies in India
13. Internationally renowned MNC'S
14. Top 20 core companies in India to offer electrical jobs
15. Exclusive Government jobs for Electrical Engineers

Electrical motors and Generators

1. Ajay Engineers http://www.ajayengineers.com
2. All India Electric Motor Manufacturers' Association http://www.aiemma.com/
3. Aqua Brand Submersible Sewage Pump http://www.aquapumps.com
4. Compact http://www.compactlighting.net
5. Crown Electric Company http://www.crown-gear.com
6. Lawkim http://lawkimindia.com/
7. MMC Electric Company http://www.dynafluxindia.com
8. MS Enterprises and Trimega Power Corporation http://www.msein.com
9. National Electrical Industries - Ahmedabad. http://www.elmomachines.com/
10. Numeric Power Systems http://www.numericups.com
11. Pranshu Electricals http://www.pranshuelec.com/
12. Reva Industries http://www.reva.com/
13. Rotomag Motors & Controls Pvt. Ltd. http://www.rotomag.com
14. Rudrashakti Electronics http://www.rudrashakti.com
15. Sanjay Diesels - Diesel Generating Sets. http://www.dgsets.com/
16. Venus Industrial Corporation http://www.venusind.com/
17. A-One Industries. http://www.aoneindustries.com/contactus.html

Consultancy (Electrical Engineering)

1. APJ Projects http://www.apjprojects.com
2. Consolidated Consultants and Engineers Pvt. Ltd http://www.consolidatedconsultants.com
3. DSON Enterprises http://www.dsonenterprises.com
4. Eltech Engineers http://www.eltechindia.com/
5. John Mech-El Technologies (P) Ltd http://www.johnmech-el.com/
6. Mandvi Electric Works http://www.bicserve.com/
7. Miraj Instrumentation Services http://www.mirajinstrumentation.com
8. PG Associates http://www.engineeringconsultant.in
9. Power Gem Engineers - Consultants in Power Generation. http://www.powergem.com/
10. Secon Engineers http://www.seconindia.com
11. Shanti Enterprises Electricals Limited http://www.shantielectricals.com
12. Shashi Electricals http://www.shashielectricals.com
13. SK Systems http://www.sksystem.com
14. Tata Consulting Engineers http://www.tce.co.in
15. Nutronics India http://www.nutronicsindia.com/

Electrical appliances

1. Ajay Industrial Corporation http://www.ajayindustrial.com/
2. Ankit Electricals http://www.ankitelectricals.com
3. A.P.C. System & Products Pvt. Ltd http://www.apcsp.com
4. Arka Trading & Services http://www.mfdplaza.in
5. Bajaj Electricals Ltd - Part of Bajaj Group. http://www.bajajelectricals.com/
6. Electroil http://www.electroil.com/
7. Eveready Industries India Ltd http://www.evereadyindustries.com/
8. Graftec india http://graftec.trade-india.com
9. Indexelectronics http://www.indexelectronics.com
10. Khaitan Group http://www.khaitan.com/
11. Lloyd Electric & Engineering Limited http://www.lloydengg.com/
12. Modern Electrical Stores http://www.modernelectricalsindia.com/
13. Needo electronics and electricals pvt. Ltd. http://www.needoindia.com
14. Picasso home products http://www.picassoappliances.com/
15. Polor Industries Ltd http://www.polarinc.com/
16. Rajshree India Ltd. http://www.rajshreefans.com
17. Shilpa Electricals http://www.shilpaelectricals.com/
18. Super Impex http://www.superimpex.com
19. Tri Star Engineering Industries http://www.tristarengg.com
20. Vijay Electricals http://www.vijayelectricalspune.com/
21. Vxl Technologies Ltd. http://www.vxldesign.com
22. XtremeWorx http://www.xtremeworx.net

Electrical components companies

1. Ace Bimetalliks India Pvt. Ltd. http:// www.aceelectricals.com
2. Aditron India Pvt. Ltd. (Engineering Division) http://www.aiplen.com
3. Admir Ovens http://www.admir.com
4. Arvind Anticor Ltd http://www.picklingplant.com
5. Asiatic Electronic Industries. http://www.asiatic-india.com/
6. Axis Electrical Components India Pvt. Ltd. http://www.axis-india.com
7. Balar Marketing Pvt. Ltd http://www.allelectricalproducts.com/
8. Bhartia Industries Limited http://www.bchindia.com
9. Brass Copper & Alloy (I) Ltd. http://www.hexworldwide.com
10. Brightech Valves and Controls Pvt. Ltd. http://www.brightechvalves.com
11. Caltech Engineering Services http://www.caltechindia.com
12. Color Design India http://www.colordesigntech.com/
13. Consult Techniques (I) Pvt. Ltd http://www.consulttechnique.com/
14. Deki Electronics Ltd. http://www.dekielectronics.com
15. Elpro International Limited http://www.elproindia.com/
16. Elymer http://www.elymer.com
17. E S Electronics (India) Pvt. Ltd http://www.energysaversindia.com/
18. Finetech Engineering Corporation http://www.finetechindia.com
19. Gayatri Control, Ahmedabad http://www.gayatricontrol.com/
20. Gemscab Industries Ltd http://www.gemscab.com/
21. Hallmark Electronics http://www.hallmarkelect.com/
22. India International House Ltd http://www.builderhardware.com/
23. Jaykrishna magnetics pvt.ltd http://www.jkmagnetics.com
24. Leotech Group http://www.leotechindia.com/
25. Maxx Mobile Phone Accessories Pvt. Ltd http://www.maxmobile.co.in
26. Mehta Engineering Enterprise http://www.mehtaswitch.com

27. Mehta Tubes Ltd http://www.mehta-group.com/
28. Mellcon Engineers http://www.mellcon.com
29. Micromot Controls http://www.micromotcontrols.com
30. Muskaan Engineers http://www.electricitysaver.com/
31. Neelam Import Pvt. Ltd. http://www.cellking.org
32. Onload Gears http://www.onloadgears.com/
33. Orton Engineering Pvt. Ltd, Thane http://www.ortonengineering.com/
34. Persang Alloy Industries http://www.webmasterindia.com/persangalloy
35. PMT Engineers http://www.pmtengineers.com
36. Powercap Systems (Madras) Pvt. Ltd http://www.transformersindia.com/
37. Powertek Equipment Company http://www.powertekindia.com/
38. Pragati Electrocom Pvt. Ltd http://www.pragatielectrocom.com/
39. Pran Electronics Pvt. Ltd. http://www.pranelectronics.com
40. Precicraft Components India Pvt. Ltd http://www.precicraft.com/
41. Prima Automation India Pvt. Ltd http://www.prima-automation.com/
42. Rittal India Pvt Ltd http://www.rittal-india.com
43. Sanghi Yantra Udyog http://www.skyuindia.com/
44. SKN - Bentex Group of Companies. http://www.sknbentex.com/
45. South India Industrial Suppliers http://siis-india.com/bus_bar_support.html
46. Square Automation Pvt. Ltd http://www.squareautomation.com/
47. Sudhir Switchgears http://www.sudhirswitchgears.com
48. Syntron Controls http://www.syntron-controls.com
49. Torque Master Tools Pvt. Ltd http://www.torquemasterindia.com/
50. United Core http://www.unitedcores.com/
51. Utiliti Controls http://www.utiliticontrols.com/
52. valrack modular systems pvt.ltd http://www.valrack.com
53. Wavetronics http://www.wavetronicsindia.com
54. Rane Holdings Limited http://www.rane.co.in

Lighting & luminaries

1. A.K. Electricals http://www.akelectricals.com/
2. APCO India http://www.indiabizclub.net/Electrical/APCO_INDIA.html
3. Aquascape engineers http://www.fountainsnozzles.com
4. Arihant Enterprises : http://www.arihantsecurityindia.com/
5. Atlas Electricals www.indiabizclub.net/Electrical/ATLAS_ELECTRICALS.html
6. Baliga Lighting http://www.baliga.com/
7. Crompton Greaves Limited. http://www.cglonline.com/
8. Decon Lighting http://deconlighting.com
9. GE Lighting India http://www.gelighting.com/india/index.html
10. Jain Industrial Lighting Corporation http://www.indiamart.com/jilco/
11. Jayanta Lamp Industries Pvt.Ltd : http://www.jayantagroup.com
12. Kuber Lighting Pvt Ltd http://www.kuber.biz
13. Litray Lighting : http://www.litraylighting.com/
14. Mindscreen Pvt. Ltd. http://www.mindscreenfilms.com/
15. Peralites http://www.indiabizclub.net/Electrical/PEARLITES.html
16. Sam International http://www.indiamart.com/
17. Shyam Electricals - http://www.shyamelectricals.com/
18. Hpl Electric & Power Pvt.Ltd http://www.hplindia.com

Power Generation

1. Advance Engineering Company - http://www.advanceengineering.com/
2. APGENCO http://www.apgenco.com/

3. Birla Power Solutions Limited http://www.birlapower.com
4. Dyna Hitech Power Systems Ltd http://www.dynahitech.com
5. Essar Group http://www.essar.com/Group/group.asp
6. Essar Power Ltd. http://www.essar.com/
7. Jindal Steel & Power Ltd. http://www.jindalsteelpower.com
8. Kaiga Atomic Power Station http://www.npcil.org/docs/kaigaps.htm
9. Kakrapar Atomic Power Station http://www.npcil.org/docs/kaps.htm
10. Kirloskar Electric Co http://www.kirloskar-electric.com/
11. Lanco Industries http://www.lancogroup.com/groups/kpower/kpower.html
12. Madras Atomic Power Station (MAPS) http://www.npcil.org/
13. Magnum Power Generation Ltd http://www.magnumgrouponline.com/power/
14. Narora Atomic Power Station http://www.npcil.org/docs/naps.htm
15. National Thermal Power Corporation (NTPC) http://www.ntpc.co.in
16. NEPC India Ltd http://www.nepcindia.com
17. PTC India http://www.ptcindia.com
18. Rajasthan Atomic Power Station (RAPS) http://www.npcilraps.com/
19. Rajasthan Renewable Energy Corporation Limited (RRECL) http://www.rrecl.com/
20. Reliance Energy http://www.rel.co.in
21. Tarapur Atomic Power Station http://www.npcil.org/docs/taps.htm
22. Tata Electric Companies http://www.tata.com
23. Tata Power http://www.tatapower.com/
24. Techno Instrument India Pvt.Ltd web site url: http://www.tiiindia.com/
25. Torrent Power web site url: http://www.torrentpower.com/
26. Uttar Pradesh Power Corporation Ltd http://www.uppcl.org/
27. ABB Ltd www.abb.co.in/
28. Adani Power Ltd www.adanipower.com/
29. Aplab Ltd www.aplab.com/
30. BF Utilities Ltd www.bfutilities.com/
31. CESC Ltd. www.cescltd.com/
32. CMI Ltd. www.cmilimited.com.au/
33. DLF Power Limited www.eipowertech.com/dlf_power_limited.htm
34. DPSC Ltd www.dpscl.com/
35. Energy Development Company Ltd www.energy.com.ph/
36. Entegra Ltd www.entegra.co.in/
37. GMR Infrastructure Ltd www.gmrgroup.in/
38. Gujarat Industries Power Company Ltd www.gipcl.com/
39. GVK Power & Infrastructure Ltd www.gvk.com/
40. HBL Power Systems Ltd www.hbl.in/
41. Indowind Energy Ltd www.indowind.com/
42. Indo power projects Ltd www.indopowerprojects.in/
43. Jaiprakash Power Ventures Ltd www.jppowerventures.com/
44. Kalpataru Power Transmission Ltd www.kalpatarupower.com/
45. KSK Energy Ventures Ltd www.ksk.co.in/
46. National Wind & Power Corpn. Ltd www.nationalwind.com/
47. Neyveli Lignite Corpn. Ltd www.nlcindia.com/
48. NHPC Ltd. www.nhpcindia.com/
49. NTPC Limited www.ntpc.co.in/
50. Power Grid Corpn. Of India Ltd www.powergridindia.com/
51. PTC India Ltd www.ptcindia.com/
52. Reliance Power Ltd www.reliancepower.co.in/

53. Savant Infocomm Ltd www.savant-infocomm.com/
54. Sun Source (India) Ltd www.sunsource.in/about_us.htm
55. Suryachakra Power Corpn. Ltd www.suryachakra.in/
56. Suzlon Energy Limited www.suzlon.com/

Electric wires & Cables

1. Aksh Optifibre Limited http://www.akshoptifibre.com/
2. Anant Distributors Private Ltd. http://www.proflexcable.com/
3. Brimson Cables Private Ltd http://www.brimsoncable.com/
4. Capital Cables India Limited - http://www.indiantrade.com/cci/
5. Colt Cables Private Limited http://www.coltcables.com/
6. Cords Cable Industries Ltd http://www.cordscable.com/
7. Delton Cables Limited - http://www.deltoncables.com/
8. Fort Gloster Industries Limited http://www.glostercables.com/
9. Kaydour Cables India http://www.kaydourcables.com
10. KEI Industries Limited http://www.kei-ind.com/
11. Lapp India http://www.lappindia.com/
12. National Cable Industries http://www.nationalcables.com/
13. Navinbhai Cables Private Ltd http://www.ncplindia.com/
14. Neolex Cables http://www.neolexcable.com/
15. North Eastern Cables Private Ltd //www.khetangroup.com/
16. Novoflex Marketing Private Limited. http://www.novoflexgroup.com/
17. Polycab Wires Private Limited http://www.polycab.com/
18. Q-Flex Cables Limited http://www.qflexcable.com/
19. Ravin Cables limited - Primecab brand of cables. http://www.primecab.com/
20. Relemac India http://www.relemacindia.com
21. RollRing Industries - Calicut, Kerala. http://www.rollring.com/
22. Samdaria Electricals http://www.samdariaelectricals.co.in/
23. Satish Enterprises http://www.satishenterprise.com/
24. Shree Nakoda Cables Private Limited. http://www.nakodacables.com/
25. Skytone Electricals (India) http://www.skytonecables.com/
26. Surbhi Cables Industries Private Limited. http://www.indiamart.com/surbhi/
27. Surbhi Telelink Pvt. Ltd http://www.surbhiindia.com/
28. Torrent Cables Ltd http://www.torrentcables.com/
29. Universal Cables http://www.universalcablesltd.com
30. Usha Martin http://www.ushamartin.com
31. Weather Crafts Ltd http://www.weathercraft.com/
32. Finolex Cables Limited http://www.finolex.com

Electrical exporters

1. Arbariya steels http://www.arbariya.com/
2. Bajaj International Pvt. Ltd. http://www.bajajinternational.com/
3. Biax http://www.biaxmetals.com/
4. Brightech Valves and Controls Pvt Ltd http://www.brightechvalves.com
5. Dynamic Scaffolding & Equipment Co http://www.dynamicscaffolding.com/
6. Excel Metal And Engg. Industries http://www.excelmetal.net
7. Impex Trading Company http://www.impextradingco.com
8. Miltop Trading Company http://www.miltop.com/
9. Om(India)Exports http://omindiaexpo.com
10. Oriental Export Corporation http://www.indialinks.com/oriental/
11. Sevana Electrical Group http://www.sevana.com/
12. Veejay Lakshmi Engineering Works Limited http://www.veejaylakshmi.com

13. Vishal Electromag Industries http://www.vishalmotor.com
14. Vaibhav Electricals http://www.vaibhavelectricals.com
15. Industrial Forging Industries http://www.ifi-india.net/
16. Imperial Brass Component http://electronics-electrical.exportersindia.com
17. M/s Horizon Exports http://www.horizonexport.net
18. Golden Crest Marketing Network Pvt. Ltd. http://www.aceenergy.co.in/
19. Shree Krishna Enterprises http://www.shreekrishnaenterprises.co.in/
20. Sahiba International Trading Company http://www.sahibainternational.com
21. Pushpak Metals web site url: http://www.pushpakmetals.com/
22. IEEMA http://www.ieema.org
23. ELSTER METERING (P) LTD http://www.elstermetering.com/
24. Shivam Electronics http://www.shivamelectronics.com
25. SUBRTO http://www.subrtoburnishing.com/
26. Unitek Engineers http://www.unitekengineers.com
27. Euro Technologies http://www.eurotapes.in/

Measurements & Instrumentation

1. Active Control Pvt Ltd http://www.indiamart.com/activecontrols/
2. Autometers Alliance Limited. http://www.autometers.com/
3. EIP Bulk Control Pvt Ltd http://www.eipbulkcontrols.com/
4. IMP Power Limited http://www.imp-power.com/
5. Instruments International http://www.indorecity.com/ii/index.html
6. Kanji Precision Works http://www.kanjimeters.com
7. Mittal Enterprises http://www.indiamart.com/mittalenterprises/
8. Modsonic http://www.modsonic.com/
9. Nippon Instruments http://www.nipponinstruments.com/
10. Poonawala Electro Weigh http://www.peweigh.com
11. Prok Devices http://www.prokdvs.com
12. Shanti Instruments http://www.shanti-instruments.com
13. Texlab Industries http://www.texlabindia.com
14. Vasavi Electronics http://www.vasavi.com
15. VPL Infotech http://vplinf.com

Power Distribution

1. Areva T&D India http://www.areva-td.co.in/
2. BSES Yamuna Power Ltd and BSES Rajdhani Power Ltd. http://www.bsesdelhi.com/
3. Central Power Distribution Company of Andhra Pradesh Limited http://www.apcentralpower.com/
4. CESC Limited http://www.cescltd.com
5. Eastern Power Distribution Company of Andhra Pradesh Limited http://www.apeasternpower.com/
6. Elpro International Limited http://www.elproindia.com/
7. Gujarat Electricity Board http://www.gseb.com
8. Haryana Power Utilities http://www.haryanaelectricity.com/
9. Hubli Electricity Supply Company Limited (HESCOM) http://www.hescom.org/
10. Maharashtra State Electricity Distribution Company Limited http://www.mahadiscom.in
11. Natinal Hydroelectric Power Corporation of India http://www.nhpcindia.com
12. Noida Power Company Ltd http://www.noidapower.com
13. North Delhi Power Limited http://www.ndplonline.com/
14. Power Grid Corporation Of India http://www.powergridindia.com
15. Southern Power Distribution of Andhra Pradesh http://www.apspdcl.in
16. Transmission Corporation of Andhra Pradesh (AP TRANSO) http://www.aptranscorp.com/

Transformers

1. Emco Limited http://www.emcoindia.com
2. Golecha Electro Stampings. http://www.golecha.com/

3. Intaf India http://www.intafindia.com/
4. Kappa Electricals Private Ltd http://www.kappaelectricals.com/
5. Kotsons Transformers http://www.kotsons.com/
6. Mahindra Electrical Works http://www.mewindia.com
7. Marson's Electricals http://www.marsonselectricals.com/
8. P.M. Electronics Limited. http://www.indiamart.com/pme/
9. Prismatic India http://www.wind-it.com/
10. Raksan Transformers Private Ltd http://www.raksantransformers.com/
11. Roland Electronics and devices Private Ltd. http://www.redpl.com/
12. Sai Electricals http://www.saielectricals.com/
13. Tesla Transformers Limited http://www.teslatransformers.com/
14. Transformers and Electricals Kerala Limited. http://www.telk.com/
15. Transformers and Rectifiers (India) Ltd. http://www.jmtril.com
16. T.S. International http://www.transformers-reactors.com

Green Energy Companies in India

1. **Suzlon Energy:** Suzlon is of course the first company that comes to mind. They are one of the leading windenergy companies in India are one of the better known alternative energy companies in India. Here are some details from their website.

Conceived in 1995 with just 20 people, Suzlon is now a leading wind power company with:

- Over 16,000 people in 25 countries
- Operations across the Americas, Asia, Australia and Europe
- Fully integrated supply chain with manufacturing facilities in three continents
- Sophisticated R&D capabilities in Belgium, Denmark, Germany, India and The Netherlands
- Market leader in Asia, Suzlon Market Share (Combined with REpower) rose to 9.8% thereby making Suzlon 3rd * largest wind turbine manufacturing company in the world.

2. **Orient Green Power Limited:** Primarily engaged in the Wind and Biomass energy space. Currently windconstitutes the majority of their energy portfolio, so this is another one of India's wind energy companies. As of March 31, 2010, their total portfolio of operating projects included 193.1 MW of aggregate installed capacity, which comprised 152.6 MW of wind energy projects and 40.5 MW of biomass projects. Their portfolio of committed and development projects included approximately 815.5 MW of prospective capacity, which comprised an estimated 622.0 MW of wind energy projects, 178.5 MW of biomass projects and a 15.0 MW small hydroelectric project

3. **Indowind Energy Limited:** Indowind Energy Limited is also a wind energy company that develops windfarms for sale, manages the wind assets, and generates green power for sale to utilities and corporates. Turnkey implementation of Wind Power Projects, from concept to commissioning. Wind Asset Management Solution for installed assets, including operations, billing, collection of revenue to project customers. Supply of Green Power to Customers. CERs (Carbon Credit) Sales and Trading.

4. **Suryachakra Power Corporation Limited:** SPCL is the flagship company of Suryachakra Group withinterests in Power generation – renewable energy (biomass, Solar, hydro, Wind) and Clean Technology / Ultra Super Critical Thermal Power Plants (coal, Gas), Engineering Consultancy and Urban infrastructure development activities. Suryachakra Power Corporation Limited has established 3 wholly owned subsidiaries for setting up of renewable energy (biomass) power projects and also acquired stake in Sri Panchajanya Power Private limited, which was setting up a 10 MW Biomass Power Plant at Hingoli, Maharashtra.

5. **NEPC India:** This is a Public Limited Company promoted by the Khemka Group with the primary objectiveof promoting wind energy. This successful Group has a multi crore turnover from diversified activities in the field of Power Generation from Wind Energy and manufacture and marketing of Wind Turbine Generator (a renewable energy device).

6. **Azure Power:** Azure Power is the green energy space as it is one of the solar energy companies in India. Itis a solar power company, and they are supplying power to 20,000 people in 32 villages in Punjab.

7. **AuroMira Energy:** Auro Mira is also a green technology energy company that is private, and present in theBiomass, Small Hydel and Wind Sectors. It plans to develop over 1000 MW capacity by 2012. AME is presently focusing in Biomass, Small Hydro and Wind Sectors. AME plans to invest $ 900 Million to develop, own and operate over 1000 MW in clean energy in addition to WTG manufacture and to develop over 15000 acres of energy plantation in the next five years. AME intends to foray into other clean energy technologies, solar, bio-diesel etc. in the future.

8. **Husk Power Systems:** This is truly an alternate energy company which owns and operates 35-100 kW "mini power-plants" that use discarded rice husks to deliver electricity to off-grid villages in the Indian "Rice Belt

9. **RRB Energy Limited:** This company is in the field of Wind Power Generation, and is an ISO 9001:2008and ISO 14001:2004 certified Company. RRBEL is also an Independent Power Producer having established wind farms of aggregate megawatt capacity.

10. **Moser Baer Solar Limited:** This is a subsidiary of Moser Baer that is one of the solar energy companies aswell. The Group's photovoltaic manufacturing business was established between 2005 and 2007 with the primary objective of providing reliable solar power as a competitive non-subsidized source of energy.

Internationally renowned MNC's to offer electrical jobs

Cisco, Hewlett Packard, Intel, AMD, IBM, Ford, General Electric, General Motors, Lockheed Martin, Lucent Technologies, Moog, Micron, Motorola, Nokia, Qualcomm, Rockwell, Sun Microsystems, Atto Technology, MTI and Texas Instruments.

Top core companies in India to offer electrical jobs

1. Bharat Sanchar Nigam Limited
2. Tata Consultancy Services
3. Bharti Airtel Limited
4. Wipro Ltd
5. Infosys Technologies Limited
6. Hewlett-Packard India
7. HCL Infosystems Limited
8. Reliance Communications Ltd
9. LG Electronics India Pvt Ltd
10. IBM India Pvt Ltd
11. Videocon Industries Ltd
12. HCL Technologies Limited
13. Satyam Computer Services Ltd
14. Siemens Ltd.
15. Samsung India Electronics Pvt. Ltd.
16. Mahanagar Telephone Nigam Ltd
17. Redington (India) Limited
18. Cognizant Technology Solutions
19. Idea Cellular Ltd
20. Videsh Sanchar Nigam Limited

Exclusive Government jobs for Electrical Engineers

1. ISRO
2. DRDO
3. BEL
4. BHEL
5. GAIL
6. SAIL
7. HAL
8. HPCL
9. NTPC
10. ONGC
11. IOCL
12. RRB
13. ECIL
14. APGENCO
15. APTRANSCO

Ref: http://www.regencyengg.com/eee_job_offer.html

TCS Latest Placement Paper Aug 22nd 2010 at SJB college Of Eng,bangalore
Aptitude Test consists of 35 questions and here we have been given Negative Marking of 0.33 per wrong answer. At the selection the bench mark was 22marks.

It's an easy test where more than 25 questions can be cleared easily

Coming to questions first search for the numerical data in the questions and just the logic how the questions can be solved

1. Two bowls are taken, one contains water and another contains tea. one spoon of water is added to second bowl and mixed well, and a spoon of mixture is taken from second bowl and added to the second bowl. Which statement will hold good for the above?

(Ans: second liquid in first bowl is smaller than the first mixture in second bowl)

2. Which is the smallest no divides 2880 and gives a perfect square?
a.1 b.2 c.5 d.6
Ans: c
3. Form 8 digit numbers from by using 1, 2,3,4,5 with repetition is allowed and must be divisible by4?
a.31250 b.97656 c.78125 d.97657
Ans: c
4. One problem on (a3-b3)/(a2+ab+b2)

Ans: 'a-b'

5. Rearrange and categorize the word 'RAPETEKA'?

Ans: bird

6. In school there are some bicycles and 4wheeler wagons.one Tuesday there are 190 wheels in the campus. How many bicycles are there?

Ans: 15

7. Key words in question (Fibonacci series, infinite series, in the middle of the question one number series is there….I got the series 3 12 7 26b 15?

Ans:54

(Logic: 3*2+1=7 12*2+2=26

7*2+1=15 26*2+2=54)

8. A father has 7 penny's with him and 1 water melon is for 1p, 2chickoos for 1p, 3 grapes foe 1p.he has three sons. How can he share the fruits equally?
Ans: 1 watermelon,2chickoos,1grape

9. A lies on mon, tues, wed and speak truths on other days, B lies on thur, fri, sat

and speaks truths on other days.. one day a said I lied today and B said I too lied today. What is the day?

10. Man, Bear, North, South, walks.

Ans: White

11. (1/2) of a number is 3 times more than the (1/6) of the same

number? Ans: 9

12. There are two pipes A and B. If A filled 10 liters in hour B can fills 20 liters in same time. Likewise B can fill 10, 20, 40, 80,160….if B filled in (1/16) th of a tank in 3 hours, how much time will it take to fill completely?

Ans:7 hours

13. KEYWORDS:T.Nagar,Chennai,1-100,prime numbers b/n 140-180,How many 2's are there?

Ans: 20 (Not only 2's ,1's,3's,4's,5's,6's,7's,8's,9's,0's also 20)

14. One question has last part like difference between two terms is 9 and product of two numbers is 14, what is the squares of sum of numbers?

Ans:109

15. A man is standing before a painting of a man and he says I have no bro and sis and his father is my father's son?

Ans: His son

16. What is the value of [(3x+8Y)/(x-2Y)]; if
x/2y=2? Ans:10 {the numerical may change)

17. A pizza shop made pizzas
with to flavours.in home there are 'N' different flavors, in that 'M' flavors are taken to made pizza.in how many ways they can arrange? (Logic: NcM)

18. One grandfather has three grandchildren, two of their age difference is 3, eldest child age is 3 times youngest child's age and eldest child's age is two times of sum of other two children. What is the age of eldest child?

Ans:15

19. In a market 4 man are standing .the average age of the four before 4years is 45,aftyer some days one man is added and his age is 49.what is the
average weight of all?

Ans: 49

20. KEYWORDS: one organization ,material labor and maintenance are in the ratio of 4:6:7,the material cost is:100,what is the total cost?

Ans: 425

21. KEYWORDS: density, reluctance, sensitivity, voltage ,current, what is the resistance Formula is “R=V/I”
22. KEYWORDS: Sports readers,10 tables,4chairs per table, each table has differentnumber of people then how many tables will left without at least one person?
Ans : 6
23. KEYWORDS: Die, card, coin, b/n 2 to 12

24. In a school for a student out of a 100 he got 74 of average for 7 subjects and he got 79 marks in 8th subject. what is the average of all the subjects?
Ans: 74.625
25. In a question ,last part has ,the ages of two people has the ratio of 6:6 and by adding the numbers we get 44,after how many years the ratio would be 8:7?
Ans: 8

26. Two years before Paul’s age is 2times the Alice age and the present age of Paul is 6times the Alice. what is the presents Paul’s age???(3years) “u try to solve this question once”
27. One train travels 200m from A to B with 70 km/ph. and returns to A with 80kmph, what is the average of their speed?

This are the only question which i remember

All The Very Best to my dear friends !

25 Sample Questions of TCS

Q1) Given a collection of points P in the plane , a 1-set is a point in P that can be separated from the rest by aline, .i.e the point lies on one side of the line while the others lie on the other side. The number of 1-sets of P is denoted by n1(P). The minimum value of n1(P) over all configurations P of 5 points in the plane in general position (.i.e no three points in P lie on a line) is

a) 3
b) 5
c) 2

Q2) Paul the octopus who has been forecasting the outcome of FIFA world cup matches with tremendousaccuracy has now been invited to predict ICC world cup matches in 2011. We will assume that the world cup contenders have been divided into 2 groups of 9 teams each. Each team in a group plays the other teams in the group. The top two teams from each group enter the semi finals (after which the winner is decided by knockout).

However, Paul has a soft spot for India and when India plays any team, Paul always backs India. Alas, his predictions on matches involving India are right only 2 out of 3 times. In order to qualify for the semi finals, it is sufficient for India to win 7 of its group matches. What is the probability that India will win the ICC world cup?

a) (2/3)^10
b) (2/3)^9 + 8/3 * (2/3)^9
c) 8/3 * (2/3)^9
d) (2/3)^10 + 8/3*(2/3)^9

Q3) A toy train produces at least 10 different tunes when it moves around a circular toy track of radius 5 metersat 10 meters per minute. However , the toy train is defective and it now produces only two different tunes at random. What are the odds that the toy train produces 4 consecutive music tunes of the same type?

a) 1 in 16
b) 1 in 4
c) 1 in 8

Q4) A number when divided by D leaves a remainder of 8 and when divided by 3D leaves a remainder of 21 .What is the remainder left, when twice the number is divided by 3D?

a) 13
b) cannot be determined
c) 3
d) 42 **(solution:c)**

Q5) Six friends decide to share a big cake. Since all of them like the cake, they begin quarreling who gets to first cut and have a piece of the cake. One friend suggests that they have a blindfold friend choose from well shuffled set of cards numbered one to six. You check and find that this method works as it should simulating a fair throw of a die. You check by performing multiple simultaneous trials of picking the cards blindfold and throwing a die. You note that the number shown by the method of picking up a card and throwing a real world die, sums to a number between 2 and 12. Which total would be likely to appear more often – 8,9 or 10?

a) 8
b) All are equally likely
c) 9
d) 10

Q6) One day Alice meets pal and byte in fairyland. She knows that pal lies on Mondays, Tuesdays andWednesdays and tells the truth on the other days of the week byte, on the other hand, lies on Thursdays, Fridays and Saturdays, but tells the truth on the other days of the week. Now they make the following statements to Alice – pal. Yesterday was one of those days when I lie byte. Yesterday was one of those days when I lie too. What day is it ?

a) Thursday
b) Tuesday
c) Monday
d) Sunday **(solution:a)**

Q7) A car manufacturer produces only red and blue models which come out of the final testing area completelyat random. What are the odds that 5 consecutive cars of the same color will come through the test area at any one time?

a) 1 in 16
b) 1 in 125
c) 1 in 32
d) 1 in 25

Q8) Alok is attending a workshop "How to do more with less" and today's theme is*Working with fewer digits*.The speakers discuss how a lot of miraculous mathematics can be achieved if mankind(as well as womankind) had only worked with fewer digits.
The problem posed at the end of the workshop is
How many four digit numbers can be formed using the digits 1, 2,3,4 ,5 (but with repetition) that are divisible by 4? Can you help Alok find the answer?

a) 100 b) 125 c) 75 d) 85

Q9) Rearrange the following letters to make a word and choose the category in which it Ms RAPETEKA

a) Bird
b) Vegetable
c) City
d) Fruit

Q10) On planet korba, a solar blast has melted the ice caps on its equator. 9 years after the ice melts, tinyplanetoids called echina start growing on the rocks. Echina grows in the form of circle, and the relationship between the diameter of this circle and the age of echina is given by the formula
$d = 4*\sqrt{(t-9)}$ for $t \geq 9$
where d represents the diameter in mm and t the number of years since the solar blast.
Jagan recorded the radius of some echina at a particular spot as 7mm. How many years back did the solar blast occur?

a) 17
b) 21.25
c) 12.25
d) 12.06 **(solution:b)**

Q11) In the reading room of a library, there are23 reading spots. Each reading spot consists of a round tablewith 9 chairs placed around it. There are some readers such that in each occupied reading spot there are different numbers of readers. If in all there are 36 readers, how many reading spots do not have even a single reader?

a) 8
b) None
c) 16
d) 15 **(solution:d)**

Q12) Ferrari S.P.A is an Italian sports car manufacturer based in Maranello, Italy. Founded by Enzo Ferrari in1928 as Scuderia Ferrari , the company sponsored drivers and manufactured race cars before moving into production of street-legal vehicles in 1947 as Feraari S.P.A. Throughout its history, the company has been noted for its continued participation in racing, especially in Formula One where it has employed great success .Rohit once bought a Ferrari . It could go 4 times as fast as Mohan's old Mercedes. If the speed of Mohan's Mercedes is 46 km/hr and the distance traveled by the Ferrari is 953 km, find the total time taken for Rohit to drive that distance.

a) 20.72
b) 5.18
c) 238.25
d) 6.18 **(solution:b)**

Q13) A sheet of paper has statements numbered from 1 to 70. For all values of n from 1 to 70. Statement n says ' At least n of the statements on this sheet are false. ' Which statements are true and which are false?

a) The even numbered statements are true and the odd numbered are false.
b) The odd numbered statements are true and the even numbered are false.
c) The first 35 statements are true and the last 35 are false.
d) The first 35 statements are false and the last 35 are false.

(solution:d)

Q14) Middle – earth is a fictional land inhabited by Hobbits, Elves, dwarves and men. The Hobbits and theElves are peaceful creatures who prefer slow, silent lives and appreciate nature and art. The dwarves and the men engage in physical games. The game is as follows . A tournol is one where out of the two teams that play a match, the one that loses get eliminated. The matches are played in different rounds where in every round , half of the teams get eliminated from the tournament. If there are 8 rounds played in a knock-out tournol how many matches were played?

a) 257
b) 256
c) 72
d) 255 **(solution:d)**

Q15) A research lab in Chennai requires 100 mice and 75 sterilized cages for a certain set of laboratory experiments. To identify the mice, the lab has prepared labels with numbers 1 to 100, by combining tags numbered 0 to 9. The SPCA requires that the tags be made of toxin-free material and that the temperature of the cages be maintained at 27 degree Celsius. Also, not more than 2 mice can be caged together and each cage must be at least 2 sq.ft in area. The 5 experiments to be conducted by lab are to be thoroughly documented and performed only after a round of approval by authorities. The approval procedure takes around 48 hours. How many times the tag is numbered '4' used by the lab in numbering these mice?

a) 9
b) 19
c) 20
d) 21 **(solution:b)**

Q16) There are two water tanks A and B, A is much smaller than B. While water fills at the rate of one litre every hour in A, it gets filled up like 10, 20, 40, 80, 160... in tank B.(At the end of first hour, B has 10 litres , second hour it has 20, and so on). If tank B is 1/32 filled after 21 hours, what is the total duration required to fill it completely?

a) 26 hrs
b) 25 hrs
c) 5 hrs
d) 27 hrs **(solution:a)**

Q17) Consider two tumblers, the first containing one litre of coffee. Suppose you take one spoon of water out ofthe first tumbler and pour it into the second tumbler. After moving you take one spoon of the mixture from the second tumbler and pour it back into the first tumbler . Which one of the following statement holds now?

a) There is less coffee in the first tumbler than water in the second tumbler.

b) There is more coffee in the firs tumbler than water in the second tumbler

c) There is as much coffee in the first tumbler as there is water in the second tumbler

d) None of the statements holds true.

Q18) Francois Pachet , a researcher at Sony Computer Science laboratories is also a jazz musician. He decidedto build a robot able to improvise like a pro. Named Continuator, the robot can duet with a live musician in real- time. It listens to a musical phrase and then computes a complementary phrase with the same playing style. If the cost of making the robot is divided between and then computes a complementary phrase with the same playing style. If the cost of making the robot is divided between materials , labour and overheads in the ratio of 4:6:2.If the materials cost $108. the cost of the robot is

a) $270
b) $324
c) $216
d) $ 648 **(solution:b)**

Q19) A lady has fine gloves and hats in her closet - 18 blue- 32 red and 25 yellow. The lights are out and it istotally dark inspite of the darkness. She can make out the difference between a hat and a glove. She takes out an item out of the closet only if she is sure that if it is a glove. How many gloves must she take out to make sure she has a pair of each colour?

a) 50
b) 8
c) 60
d) 42

Q20) A man jogs at 6 mph over a certain journey and walks over the same route at 4 mph. What is his averagespeed for the journey?

a) 2.4 mph
b) 4 mph
c) 4.8 mph
d) 5 mph **(solution:d)**

Q21) Spores of a fungus, called late blight, grow and spread infection rapidly. These pathogens wereresponsible for the Irish potato famine of the mid-19th century. These seem to have attacked the tomato crops in England this year. The tomato crops have reduced and the price of the crop has risen up . The price has already gone up to $45 a box from $27 a box a month ago. How much more would a vegetable vendor need to pay to buy 27 boxes this month over what he would have paid last month?

a) $27
b) $ 18
c) $45
d) $ 486

Q22) Given a collection of 36 points P in the plane and a point equidistant from all points in P, which of thefollowing are necessarily true?

A. The points in P lie on a circle.

B. The distance between any pair of points in P is larger than the distance between X and a point in P

a) A and B
b) Neither A nor B
c) B only
d) A only

Q23) In the year 2002, Britain was reported to have had 4.3m closed – circuit television (CCTV) cameras – onefor every 14 people in the country . This scrutiny is supposed to deter and detect crime. In one criminal case, the police interrogates two suspects . The ratio between the ages of the two suspects is 6:5 and the sum of their ages is 6:5 and the sum of their ages is 55 years. After how many years will the ratio be 8:7.?

a) 11
b) 6
c) 10
d) 5

Q24) Susan made a block with small cubes of 8 cubic cm volume to make a block 3 small cubes long, 9 smallcubes wide and 5 small cubes deep. She realizes that she has used more small cubes than she really needed. She realized that she could have glued a fewer number of cubes together to lock like a block with same dimensions, if it were made hollow. What is the minimum number of cubes that she needs to make the block?

a) 114
b) 135
c) 21
d) 71

Q25) Alok and Bhanu play the following coins in a circle game. 99 coins are arranged in a circle with each cointouching two other coin. Two of the coins are special and the rest are ordinary. Alok starts and the players take turns removing an ordinary coin of their choice from the circle and bringing the other coins closer until they again form a (smaller) circle. The goal is to bring the special coins adjacent
to each other and the first player to do so wins the game. Initially the special coins are separated by two ordinary coins O1 and O2. Which of the following is true ?

a) In order to win, Alok should remove O1 on his first turn.

b) In order to win, Alok should remove one of the coins different from O1 and O2 on his first turn.

c) In order to win, Alok should remove O2 on his first turn.

d) Alok has no winning strategy.

****

TCS MOCK EMAIL WRITING QUESTIONS

Directions:

1. Use all the phrases given
2. Minimum words should be 50 otherwise your email cannot be validated
3. Addressing and signing should be done as in the question given.
4. Common grammatical rules, punctuation should be according to standard English.
5. You can use your own phrases along with the phrases given.

Question : 1

As a member of your residential society, write an email to inspector of local Police station, Mr.Sharma, informing him about miscreants who ride their bikes rashly every evening outside your society. Sign the email as william. residential area - ride - rashly - children - play - elderly - walk - grocery shop - across the road - dangerous - accidents - nuisance - action - immediately.

Sample Answer:

Dear Mr.Sharma,

We are the residents of Siddartha Nagar. We would like to bring to your notice that a few guys are riding their bikes very rashly in the evening hours in the main road of the colony. As you know that this is the time when children play on the road and elderly go for an evening walk. Also there is a grocery shop across the road and many housewifes used to cross the road to buy any groceries. In the recent times we observed that due this rash driving many accidents were happened and several injured. This is creating a constant nuisance for all. So we would like to request you to take necessary action to curb these activities.

Thanking you
Yours sincerely,
William.

Question 2:

As a recent buyer of their car, write an email to the Manager of Smart Automative company, Mr.Ahmed, regarding the poor quality of service facility available in the city. Sign the email as Chopra. Outline:

very few - service centers - complaints - pending problems - maintenance - cost - time - delivery - increase - customer satisfaction

Dear Mr. Ahmed

I recently bought Fiat palio from "Sridhar Fiat show room" in Nagole. Recently I faced small problem with car AC and bought the car for maintenance. But to my utter surprise, the howroom staff told me that service is not available in their showroom and they asked me to take the car to near by service center. I found that there are very few service centers available compared to sales showrooms, and there are many complaints regarding this. This in turn is causing many pending problems and increased maintenance cost, time and delivery time. I would like to

suggest you that if more service centers are opened in the city, customer satisfaction also goes up which finally converts into more sales.

Thanks and Regards
Chopra

Question 3:

As a former student, write an email to your professor, Mr.Matt, thanking her for teaching and guidance that contributed to your overall development. Sign the email as peter.

Outline:

Successful - Placed - grateful - help - advice - grooming - values - shaping my future - sincere - professional

Dear Mr.Matt

I am very happy to tell you that I got successful in the recently conducted campus placement drive at my college. I am placed with TCS. I am extremely grateful for your help regarding my preparation. More over your advice regarding personality development helped for my personal grooming. In addition to that, your style of teaching inculcates not only those skills related to professional success but also for developing values which I believe helps for shaping my career. Once again I would like to thanks for your sincere and professional help.

with warm regards
Peter.

Question 4:

As an intern at ABC consulting Pvt.Ltd, write an email to your internship Project Manager, Mr.Ramesh, informing about the progress that you are making and some difficulties that your are encountering. Sign the email as Ben.

Outline:

Thank - challenging - progress - tight schedule - support - report - analytics - guidance - access - doubt - requirements - design.

Dear Mr.Ramesh
Thank you for allotting a challenging project for my internship. I am making steady progress and learning many new things. The project is due next month and we are on tight schedule. I need some additional support with regard to the reporting of Analytics. Your guidance helped me access the database with ease but I have several doubts regard to the requirements of the design. But I am facing little problem in reporting. Thanks and regards
Ben

Tips for Effective Communication

Have courage to say what you think.

Be confident in knowing that you can make worthwhile contributions to conversation. Take time each day to be aware of your opinions and feelings so you can adequately convey them to others. Individuals who are hesitant to speak because they do not feel their input would be worthwhile need not fear. What is important or worthwhile to one person may not be to another and may be more so to someone else.

Practice.

Developing advanced communication skills begins with simple interactions. Communication skills can be practiced every day in settings that range from the social to the professional. New skills take time to refine, but each time you use your communication skills, you open yourself to opportunities and future partnerships.

Make eye contact.

Whether you are speaking or listening, looking into the eyes of the person with whom you are conversing can make the interaction more successful. Eye contact conveys interest and encourages your partner to be interested in you in return.

Use gestures.

These include gestures with your hands and face. Make your whole body talk. Use smaller gestures for individuals and small groups. The gestures should get larger as the group that one is addressing increases in size.

Manifest constructive attitudes and beliefs.

The attitudes you bring to communication will have a huge impact on the way you compose yourself and interact with others. Choose to be honest, patient, optimistic, sincere, respectful, and accepting of others. Be sensitive toother people's feelings, and believe in others' competence.

Develop effective listening skills:

Not only should one be able to speak effectively, one must listen to the other person's words and engage in communication on what the other person is speaking about. Avoid the impulse to listen only for the end of their sentence so that you can blurt out the ideas or memories your mind while the other person is speaking.

Enunciate your words.

Speak clearly and don't mumble. If people are always asking you to repeat yourself, try to do a better job of articulating yourself in a better manner.

Pronounce your words correctly.

People will judge your competency through your vocabulary. If you aren't sure of how to say a word, don't use it.

Use the right words.

If you're not sure of the meaning of a word, don't use it. Grab a dictionary and start a daily habit of learning one new word per day. Use it sometime in your conversations during the day.

Slow your speech down.

People will perceive you as nervous and unsure of yourself if you talk fast. However, be careful not to slow down to the point where people begin to finish your sentences just to help you finish.

Developing Leadership Skills

No one is a born leader; everyone can develop leadership skills and everyone can benefit from using them. First, take time to honestly analyze yourself. Learn to understand yourself.

It's the first step to understanding others. Consider these important questions:

1. What kind of leader am I? One who helps to solve problems? A leader who helps people get along? How do others see me as a leader?
2. What are my goals, purposes, and expectations in working with this particular group? Identify areas for improvement.

Ask yourself these questions:

1. Do I try to be aware of how others think and feel?
2. Do I try to help others perform to the best of their abilities?
3. Am I willing to accept responsibility?
4. Am I willing to try new ideas and new ways of doing things?
5. Am I able to communicate with others effectively?
6. Am I a good problem solver?
7. Do I accept and appreciate other perspectives and opinions?
8. Am I aware of current issues and concerns on campus or in my community? Then after analyzing your strengths and weaknesses -- take action

Devise a strategy for upgrading your skills. Here are a few strategies to consider:

1) Communicate effectively:

Effective communication is dialogue. Barriers are created by speaking down to people, asking closed questions that elicit yes or no answers, using excessive authority, and promoting a culture that depends on unanimity. If your focus is winning the argument or if you react defensively to criticism, you'll create fear of openness and hinder the organization's growth.

Try these steps to effective communication:

- Listen actively - ask open questions. Be genuinely interested in what other's say.
- Thank people for their openness -- stress how much you value it -- even if you don't like specifically what is being said.
- Point to areas of agreement before jumping on areas of disagreement - this reduces defensiveness; members wont fear being "attacked."
- Set aside your authority to create an atmosphere of partnership to reduce fear in group members.
- Promote a culture of constructive dissent - though not to the point of paralysis.
- Portray disagreement as simply a difference of opinion. Get rid of the "I'm right, you're wrong" attitude.

2) Encourage enthusiasm and a sense of belonging. Show:

- Friendliness: others will be more willing to share ideas if you're interested in them as people too.
- Understanding: everyone makes mistakes. Try to be constructive, tolerant and tactful when offering criticism.
- Fairness: equal treatment and equal opportunity lead to an equally good effort from all group members.
- Integrity: members will take tasks more seriously if you show that you're more interested in group goals than your own personal gain.

3) Keep everyone working toward agreed upon goals:

- Remind everyone of the group's purposes from time to time. It's easy to become too narrowly focusedand lose sight of the larger goals.
- Provide encouragement and motivation, by showing your appreciation for good ideas and extra effort.
- Harmonize differences and disagreements between group members by stressing compromise andcooperation.
- Involve everyone in discussions and decisions, even if asking for opinions and ideas means a longer discussion.

4) Get to know the people around you Everyone has different abilities, wants, needs, and purpose in life. To get along with others and get results, you need to get to know them.

- Interact with group members as often as possible. The only way to get to know someone is through direct personal contact.
- Become familiar with every member of your group. Take note of each person's unique qualities and characteristics.

5) Treat others as individuals

Put your knowledge and understanding of each group member to work!

- Be aware of expectations. Everyone expects something different: recognition, a chance to learn, a chance to work with other people, etc.
- Be creative. A repetitious routine can cause boredom. A successful leader thinks of new and better approaches to old ways of doing things.
- Provide rewards. Recognition by the group is a source of personal satisfaction and positive reinforcement for a job well done.
- Delegate responsibilities. If everyone shares the work, everyone can share pride in the group's accomplishments. Let each member know what's expected of him/her, available resources, deadlines, etc.

6) Accept responsibility for getting things done

- Take the initiative. Why stand around and wait for someone else to get things started? Set an example.
- Offer help and information. Your unique knowledge and skills may be just what's needed.
- Seek help and information. Ask for advice if you need it. This will encourage group involvement and help accomplish group goals.
- Make things happen. By being decisive, energetic, and enthusiastic, you can and will help get things done!
- Know when and how to say "no."

If your time and resources are already committed, turn down extra tasks, but do it nicely.

7) Problem solve in a step - by-step way

Whether you are faced with a decision to make or a conflict to resolve, following a logical approach will help.

1. State the problem as simply and clearly as possible.
2. Gather all relevant information and available resources.
3. Brainstorm as many ideas or solutions as you can think of (with others if possible).
4. Evaluate each idea or solution and choose the best one.
5. Design a plan for using your idea or solution. Include a timetable, assigned roles, and resources to be used.
6. Follow up on your plan by asking if your idea worked and why or why not.

ANNA UNIVERSITY
CENTRE FOR UNIVERSITY INDUSTRY COLLABORATION (CUIC)
A READY RECKONER FOR ENHANCING PLACEMENT ACTIVITIES

Dr. T .Thyagarajan, Director- CUIC

ROLES AND RESPONSIBILITIES OF PLACEMENT REPRESENTATIVES

- Collect list of HR contact details through your friends / relatives / Newspaper / Faculty members / Seniors / Alumni
- Pass on the HR Contact details to Placement Officer for sending official invitations
- Ensure Placement Officer contact details in all the Department Brochures, to have single point contact
- Keep the hard and soft copies of Curriculum and Syllabus
- Keep the contact details (Email, Landline No. & Mobile No.) of all your classmates
- Keep the complete details about each student (SSLC, HSC, Semester wise GPA, CGPA, DOB, Community, History & Current Arrears)
- Keep the contact details of other Placement Representatives
- Generate comprehensive Question Bank (Both Technical and Non-Technical)
- Collect Aptitude Questions / GD Topics / Interview Questions to create Question Bank
- Give training to the needy students
- Avoid spreading Rumors / False / Assumed information (This will lead to black listing)
- Avoid accepting false information / Track records from students (This will lead to rejection of offer)
- Avoid arguing with company HRs about previous year's branch preferences

TIPS TO FACE INTERVIEWS

- Maintain Professional Ethics and Moral Standards
- Read Frequently Asked Questions by interviewers and prepare the answers and practice them
- Prepare a Comprehensive Resume
- Practice with Mock Aptitude Test / Mock GD / Mock Interview etc.,
- Prepare well in fundamental & core subjects of respective branches
- Update database after declaration of revaluation / Arrear result
- View the placement Notice Board regularly
- As for as possible change of contact details should be avoided
- Visit the company's website before attending the Pre Placement Talk (PPT) to get clear idea
- Avoid Wearing Jeans / T-shirts/ Cheppal / Half sleeves
- Be punctual for PPT as well as for Test / Interview
- Avoid standing outside or near the PPT hall
- Occupy first benches also, during the PPT
- Maintain Gender separation during the PPT
- Maintain discipline during PPT
- Avoid coming late to the PPT/test/interview
- Ask only relevant / valid questions during the PPT
- Carry Pen, Pencil, Eraser, Passport Size Photograph etc., for the test
- Avoid contacting the HR directly. It should be through CUIC only.
- Carry Resume / Copy of Mark Sheets / Community / Co-curricular / Extra-curricular Certificate etc for the interview
- Bring OBC Certificate for PSU interview
- Bring doctor certificate for differently abled physique
- Inform at the beginning itself about colour blindness, hearing disorder to avoid disqualification at the end.
- Attend the interview with clean dress (tucked-in) and neatly shaved to maintain dignity and decorum
- Wish the interviewer while entering the room. Thank the interviewer before leaving the room
- During the interview, relax and avoid showing your nervousness obvious
- Speak loudly, clearly; sit up straight; try to look at the interviewer's eyes when you speak to him/her
- Be honest in your approach
- Keep your answers brief and to the point.
- Do not give 'YES' or 'NO' replies.
- Don't discuss your personal difficulties
- Show your enthusiasm and willingness
- Exhibit your skills and abilities.
- Avoid passing bad comments /Remarks about the College/ University/ Staff during the interview
- Prepare in advance, the questions you want to ask about the job and company

- Be available till the announcement of results
- Maintain silence during announcements of results
- Do not exhibit bad mannerism during the placement activity

FREQUENTLY ASKED QUESTIONS (FAQ)

- Tell me about yourself
- What are your long range goals, ambitions, future plans?
- What do you want to be doing 5 or 10 years from now?
- How do you feel that you can contribute to this job?
- What are your hobbies?
- What are your strengths? Your weaknesses?
- What are your big accomplishments?
- What are your special abilities?
- Why you think that you are suitable for this kind of job?
- What is your career goal?
- What do you know about our company?
- Why are you applying for a job with us?
- What salary do you expect?
- Do you have any plans to go back to school?
- What kind of job profile you enjoy the most, the least and why?
- I have interviewed others for this job, why should I give you the job?
- Would you be willing to take an aptitude test?
- Can you tell me anything about yourself that you think I might want to know?
- What is the lowest salary you would accept?
- Can you handle criticism? How do you deal with it?
- Do you have any questions?

H.R. EXPECTATIONS

- Sincerity and honesty in the answers
- Attentiveness in listening to the questions
- Body language: gesture, posture, eye contact and confidence level
- Stress handling capability
- Positive approach in answering the questions
- Exhibition of skills, accomplishments and talents
- Enthusiasm and motivation level
- Command over communication skills
- Willingness and positive approach
- Exhibition of talents and accomplishments

POINTS DECIDED BY THE ORGANISATION

- Interview time and venue
- Decision on allowing identical branches
- Execution of Bond
- Change in eligibility criteria
- Place of work
- Percentage cut-off/ history of arrears / standing arrears
- Postponement of dates/ cancellation
- The number of recruits, on-board date

USEFUL WEBSITES FOR APTITUDE, GD, TECHNICAL & HR INTERVIEW

http://www.indiabix.com
http://www.freshersworld.com
http://www.placementpapers.net
http://www.allinterview.com
http://www.geekinterview.com
http://www.careersvalley.com
http://www.sampleplacementpapers.com
http://www.chetanasinterview.com
http://www.ittestpapers.com
http://www.indianfresher.com

http://www.freeplacementpapers.com
http://www.educationindiaworld.com
http://www.jobsnresults.com
http://www.psychometric-success.com
http://testfunda.com
http:/www.test4free.com
http://www.placementexpress.com

TECHNICAL

http://www. mechanicalengineeringblog.com
http://www.indiabix.com

USEFUL WEBSITES FOR ENGLISH COMMUNICATION

http://www.nonstopenglish.com
http://www.talkenglish.com
http://www.freeenglishnow.com
http://www.ego4u.com
http://www.focusenglish.com
http://www.bbc.co.uk/worldservice/learningenglish
http:/www.englishclub.com
http://www.easyenglish.com
http://learnenglish.britishcouncil.org englishbee.net
http://www.english4today.com/free_content.cfm
http://www.english-the-international-language.com
http://www.teachingengtish.org.uk
http://esl.about.com
http://www.learnenglish.de
http://www.busuu.com
http://free-esl.com

'FACTS' TO PERFORM WELL IN THE PLACEMENTS

F - Clear the subjects in **F**irst attempt
- Learn **F**oreign Language (German, Japanese, French, Chinese)

A - Have right **A**ttitude

C - Have good **C**ommunication Skills
Maintain a **C**GPA above 7.5

T - **T**hink Positive
Develop creative **T**hinking

S - Be **S**agacious. Express your wisdom and Exhibit your Talents

K.L.N. College of Engineering.

How to prepare for Anna University Examinations?

1.Don't study just for passing the tests/exams. Ensure that you understood the concepts and you can explain/ demonstrate/justify/analyze/ answer/ argue/ design /implement/draw/develop any mathematical model, based on what you have learnt. If you are confident enough, you can successfully solve any question papers/technical interviews/competitive examinations at any time without fear/confusion/ delay. Remember that, you will be working in an environment, after graduation, where all the process/operation of machineries/equipments are based on the basic scientific and engineering concepts what you have studied from first year to final year of your Engineering programme, where you are the only person to solve any problems aroused. You can't get away/escape from these. Hence, it is a lifelong learning, a wonderful experience.

2.Syllabus, books (at least 2-one Text books as prescribed in the syllabus, -one local author book) previous year question papers(atleast10), class notes, are your God/religion/food/ destiny/light. Ensure that you have studied all the contents of the syllabus, prepared correct answers for all questions in the AU question paper. **Remember that ignoring any one word in the syllabus** means you are losing 5 to 10 marks in each unit in the AU exams. Similarly, ignoring any one questions in the previous year question paper means you are losing 10 marks in each unit of AU exams. Don't expect that your Professor would cover 100% of the syllabus. Even if he/she has covered 100% of the syllabus don't think that he/she has covered 100% of each line in the syllabus. It is your responsibility to prepare 10% in excess of each lines in each units of the syllabus in addition to the contents taught by your Professors. This is possible by referring the books and the questions asked in the competitive exam books like GATE/TANCET/IES.

3.Plan your studies –right from the second week of the commencement of the classes till the semester examination is over. In a year, you will be attending the college only for 200 days(including theory/practical exams-8hours /day). You have 165 days(24 hours /day) away from the college. Prepare a time table from Monday-Friday. Take a rest on Saturday and Sunday. Allocate 3-4 hours in the evening for study.1-2 hours for completing assignments/observation/record note work. Remaining 2-3 hours for studying subjects A,B.(Mon),C,D(Tue)E,F(Wed), A,B(Thu),C,D(Fri),E,F(Sat or Sun).Each day, in addition to studying subjects for the current syllabus, you should refer competitive exam books (GATE/TANCET/IES/ Objective type questions –technical) corresponding to the current syllabus. This parallel preparation will ensure that you have prepared for state level and National level examinations there by you will be meeting the expectations of the Engineering Educational Objectives. Your preparation for AU examination should be vigorous (minimum), 15 days from the commencement of the exam and it should be maximum 2 days before the exam. You need to allocate for 8 hours per day during minimum days(early morning-6AM-10AM with a break for an hour,10AM-12 Noon-sleep/rest,12 noon-2PM-study,2PM-5PM-sleep/rest,6PM-10PM –study).Repetition/memorizing is required to retain certain contents to improve confidence on the subject. During rest time you can have group discussion with your friends or you can teach slow learners, thereby you will gain more knowledge and also help others.

4.Presentation – AU exam-General complaints by students that the valuation is not fair or poor valuation. Remarks of examiners that there is nothing in the answer paper. Parents may say that either "college is not good" or "it is a fate". Public may say "poor quality" and the experts may comment that " only 20% are

employable". These statements will go on for centuries. Many students believes that they have written right answers mostly(but many of them actually wrong) and few examiners assumed certain answers by students are wrong(but many of them are actually correct). It is 70% true that students are not presenting the answers well and it is 30% true that the valuation is not fair. But it is 95% true that the deserved students are getting expected results in most of the papers. This is because of good presentation. Good presentation involves many factors such as legible writing, good handwriting. answering correctly(100% correct),all answers with mathematical modeling/pictorial representation/drawing/layout/sketches with different colours, writing 7 pages for 16 mark questions with valid points and sketches, 4 pages for 8 marks with valid points and sketches/drawings/equations, characterizes,. Such students will solve problems correctly without any overwriting/ strikeouts. Simply, they do not cheat. These are the in-born qualities or developed over the years due to good habits, friendship, good character, obedience, hard work, well brought up by parents and blessing by God. Everyone can become like them if their attitude is good. Fear of God is the beginning of Wisdom. The examiners will know about your quality, just by referring the way you have answered Part-A- questions. A well prepared student would get a maximum of 18 out of 20 .This impresses the examiner so that they will award a maximum of 14-16 for each part-B-questions. Most of the students would answer wrongly in the Part-A-questions. This is due to their poor preparation during Class tests/internal tests, frequently taking leave, lot of diversion, skipping the classes for attending Co-Curricular/ /extra-curricular activities etc inside or outside the college.. Attending the classes is more important than attending college. Students are expected to attend 98%classes to maintain the continuity of the subjects learnt. One day absence means it will take a week to study on his/her own. If he/she fails to study on his/her own to review the classes not attended means a loss of 10 marks in the exams.

5.Know well about Why one should apply for revaluation without /with Photocopy, schedule and fees to be paid. Sometimes a well deserved students get low CGPA than he/she expected or even may fail. This may be due to error in valuation/data entry. Hence such students should not hesitate to apply for revaluation with/without photocopy. The parents should also be informed, all about these unfortunates (the misunderstanding between parents /sons/daughter/faculty may lead to unnecessary things).90% of those deserved students who applied for revaluation with photo copy benefitted after revaluation. Ignorance/communication failure of these formalities, by deserved students, may damage their life. Some students failed in revaluation secured "S"grade in the REVIEW, shows some hope in the examination system and the better prospect of the students.

6.Need to maintain high CGPA in every semester. :This is possible only when one gets "S" grade in all practical's (from first to eighth semester).Those who are regular in attending the lab classes, submitting the observation and record note in time, disciplined behavior with staff and students in the class room/laboratory/campus etc will impress the faculty in-charge of practical's, so that he/she will help such students during regular lab classes. This will improve the students to do the lab experiments with confidence and fetch them toget more marks. This will reflect in internal assessment marks also. Classification of degree-First class with distinction-More than 8.5CGPA(passed all subjects in first attempt),First class-More than 6.5CGPA at the end of eighth semester, less than this would be second class.

NG 27

PART 01 - MATHEMATICS

(Common to all candidates)

(Answer ALL questions)

1. The unit normal to the surface $x^2y+2xz=4$ at the point (2, -2, **3)** is

   1. $-i+2j+2\bar{k}$
   2. $\frac{1}{3}(-i+2j+2\bar{k})$
   3. $\frac{1}{3}(i-2j+2\bar{k})$
   4. $i-2j-2\bar{k}$

2. If r = $\sqrt{x^2+y^2+z^2}$, then V$\left(\frac{1}{r}\right)$ is equal to

   1. $\frac{\bar{r}}{r^3}$
   2. $\frac{\bar{r}}{r^2}$
   3. $\frac{-\bar{r}}{r^2}$
   4. $\frac{-\bar{r}}{r^3}$

3. If $\bar{A}=x^2zi-2y^3z^2\bar{j}+xy^2z\bar{k}$, then $div\,\bar{A}$ at (1, −1, 1) is

   1. 0
   2. –3
   3. 3
   4. 1

4. If $\bar{A}=x^2yi-2xz\bar{j}+2yz\bar{k}$, then $curlcurl\bar{A}$ is

   1. $(x+2)\bar{j}$
   2. $(2x+2)\bar{j}$
   3. $(2x+1)\bar{j}$
   4. $(2x+2y)\bar{j}$

5. If $\bar{V}=(x+2y+az)i+(bx-3y-z)\bar{j}+(4x+cy+2z)\bar{k}$ is irrotational, then

   1. $a=4, b=-1, c=2$
   2. $a=2, b=-1, c=4$
   3. $a=4, b=2, c=-1$
   4. $a=4, b=-2, c=1$

6. Which of the following is a factor of the determinant?

$$\begin{vmatrix} a+b+2c & a & b \\ c & b+c+2a & b \\ c & a & c+a+2b \end{vmatrix}$$

   1. a
   2. a - b
   3. $a+b$
   4. $a+b+c$

7. If $a+b+c=0$, one root of $\begin{vmatrix} a-x & c & b \\ c & b-x & a \\ b & a & c-x \end{vmatrix}=0$ is

   1. $x=1$
   2. $x=2$
   3. $x=a^2+b^2+c^2$
   4. $x=0$

8. If A is a 4×4 matrix. A second order minor of A has its value as 0. Then the rank of A is

1. < 2
2. $= 2$
3. > 2
4. anything

9. Given $A = \begin{pmatrix} 2 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 8 \end{pmatrix}$, then the determinant value of A^{-1} is

1. **32**
2. $\frac{1}{32}$
3. $\frac{1}{64}$
4. 64

10. If $\begin{pmatrix} 3 & 1 \\ 4 & 1 \end{pmatrix} X = \begin{pmatrix} 5 & -1 \\ 2 & 3 \end{pmatrix}$, then

1. $X = \begin{pmatrix} -3 & 4 \\ 14 & 13 \end{pmatrix}$
2. $X = \begin{pmatrix} 3 & -4 \\ -14 & 13 \end{pmatrix}$
3. $X = \begin{pmatrix} -3 & 4 \\ 14 & -13 \end{pmatrix}$
4. $X = \begin{pmatrix} -3 & -4 \\ -14 & 13 \end{pmatrix}$

11. C-R equations for a function $w = P(r,\theta) + iQ(r,\theta)$ to be analytic, in polar form are

1. $\frac{\partial P}{\partial r} = \frac{1}{r}\frac{\partial Q}{\partial \theta}, \frac{\partial Q}{\partial r} = \frac{-1}{r}\frac{\partial P}{\partial \theta}$
2. $\frac{\partial Q}{\partial \theta} = \frac{1}{r}\frac{\partial P}{\partial r}, \frac{\partial P}{\partial \theta} = \frac{1}{r}\frac{\partial Q}{\partial r}$
3. $\frac{\partial P}{\partial r} = \frac{-1}{r}\frac{\partial Q}{\partial \theta}, \frac{\partial Q}{\partial r} = \frac{1}{r}\frac{\partial P}{\partial \theta}$
4. $\frac{\partial P}{\partial \theta} = \frac{1}{r}\frac{\partial Q}{\partial r}, \frac{\partial Q}{\partial \theta} = \frac{-1}{r}\frac{\partial P}{\partial r}$

12. If $f(z) = u + iv$ is an analytic function and u and v are harmonic, then u and v will satisfy

1. one dimensional wave equation
2. one dimensional heat equation
3. Laplace equation
4. Poisson equation

13. In the analytic function $f(z) = u + iv$, the curves $u(x,y) = c_1$ and $v(x,y) = c_2$ are orthogonal if the product of the slopes m_1 and m_2 are

1. $m_1 m_2 = 0$
2. $m_1 m_2 = -\pi$
3. $m_1 m_2 = \frac{-\pi}{2}$
4. $m_1 m_2 = -1$

14. If the imaginary part of the analytic function $f(z) = u + iv$ is constant, then

1. u is not a constant
2. $f(z)$ is not a complex constant
3. $f(z)$ is equal to zero
4. u is a constant

15. If $f(z) = P(r,\theta) + iQ(r,8)$ is analytic, then $f'(z)$ is equal to

1. $e^{i\theta}\left(\frac{\partial P}{\partial r} + i\frac{\partial Q}{\partial \theta}\right)$
2. $e^{-i\theta}\left(\frac{\partial P}{\partial r} + i\frac{\partial Q}{\partial \theta}\right)$
3. $e^{-i\theta}\left(\frac{\partial P}{\partial r} + i\frac{\partial Q}{\partial r}\right)$
4. $e^{+i\theta}\left(\frac{\partial P}{\partial r} + i\frac{\partial Q}{\partial r}\right)$

16. The formula for the radius of curvature in cartesian coordinate is

1. $\frac{\left(1+(y')^2\right)^{1/2}}{y''(x)}$

2. $\frac{\left(1+(y')^2\right)^{3/2}}{y''(x)}$

3. $\frac{\left(1+(y')^2\right)^{3/2}}{(y'')^2}$

4. $\frac{\left(1+(y')^2\right)^{1/2}}{(y''(x))^2}$

17. The stationary point of $f(x,y)=x^2-xy+y^2-2x+y$ is

1. $(0,1)$
2. $(1, 0)$
3. $(-1, 0)$
4. $(1,-1)$

18. $\int x\cos x\,dx$ is

1. $x\sin x+\cos x$
2. $x\sin x-\cos x$
3. $x\sin x-x\cos x$
4. $x\sin x+x\cos x$

19. For the following data :

x :	0	2	4	6
y:	−1	3	7	11

the straight line $y=mx+c$ by the method of least square is

1. $y=-2x-1$
2. $y=x-1$
3. $y=1-2x$
4. $y=2x-1$

20. The velocity v (km/min) of a train which starts from rest, is given at fixed intervals of time t (min) a s follows :

t :	2	4	6	8	10	12	14	16	18	20
v :	10	18	25	29	32	20	11	5	2	0

The approximate distance covered by Simpson's 1/3 rule is

1. 306.3
2. 309.3
3. 310.3
4. 307.3

21. Find the cubic polynomial by Newton's forward difference which takes the following

x :	0	1	2	3
$f(x)$:	1	2	1	10

Then f (4) is

1. 40
2. 41
3. 39
4. 42

22. The first derivative $\frac{dy}{dx}$ at $x=0$ for the given data

x :	0	1	2	3
$f(x)$:	2	1	2	5

is

1. 2
2. −2
3. −1
4. 1

23. Error in Simpson's $\frac{1}{3}$ rule is of the order

1. $-h^2$
2. h^3
3. h^4
4. $\frac{2h^3}{3}$

24. A lot consists of ten good articles, four with minor defects and two with major defects. Two articles are chosen from the lot a t random (without replacement). Then the probability that neither of them good is

1. $\frac{5}{8}$
2. $\frac{7}{8}$
3. $\frac{3}{8}$
4. $\frac{1}{8}$

25. If A , B, C are any three events such that

$P(A)=P(B)=P(C)=\frac{1}{4}$;

$P(A\cap B)=P(B\cap C)=0$, $P(C\cap A)=\frac{1}{8}$.

Then the probability that atleast one of the events A , B, C occurs, is

1. $\frac{1}{32}$
2. $\frac{3}{32}$
3. $\frac{7}{8}$
4. $\frac{5}{8}$

26. To establish the mutual independence of n events, the equations needed are

1. 2^n+n+1
2. n^2+n+1
3. $2^n-(n+1)$
4. $2^n+2(n+1)$

27. If atleast one child in a family with two children is a boy, then the probability that both children are boys is

1. 3/4
2. 1/3
3. 1/4
4. 1/2

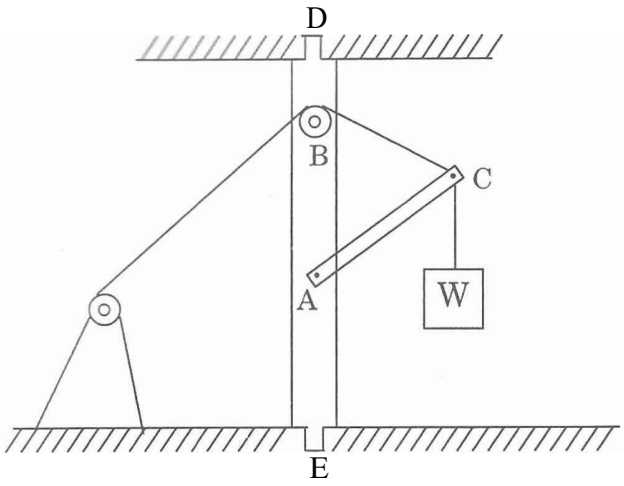
28. A discrete random variable X takes the values $a, ar, ar^2, \cdots, ar^{n-1}$ with equal probability. Then Arithmetic Mean (A.M) is

1. $a(1-r^n)$
2. $\frac{1}{n}a(1-r^n)$
3. $\frac{a}{n}\frac{(1-r^n)}{1-r}$
4. $\frac{a}{n}\frac{(r^n-1)}{1-r}$

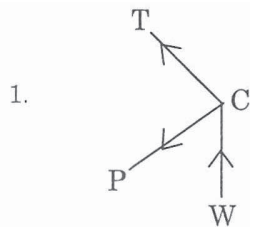
PART 02 — BASIC ENGINEERING AND SCIENCE

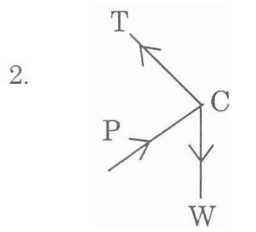
(Common to all candidates)

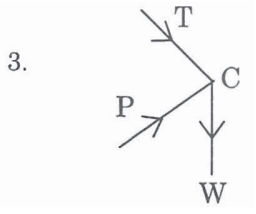
31. Free body diagram of point C of the Derrick shown below is

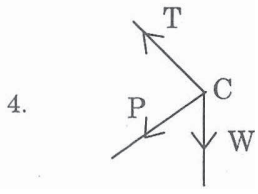


Derrick

1. 

2. 

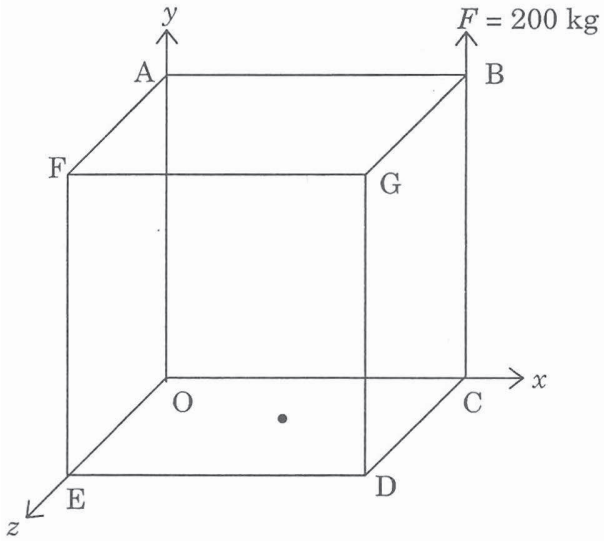
3. 

4. 

32. A 200 kg block is in contact with a plane inclined at *30"* to the horizontal. A force P, parallel to and acting up the plane, is applied to the body. If the coefficient of static friction is 0.20, the value of P to just cause motion up the plane is

1. 1.35 kg
2. 13.5 kg
3. 135 kg
4. 530 kg

33. Find the moment of the Force 'F acting along the edge *'CB'* of a cube of edge 1 m about the centre of the base of the cube OCDE, shown below.



1. 4140 Nm
2. 144 Nm
3. 1414 Nm
4. 4144 Nm

34. The motion of a particle is given by $a = 6v^{1/2}$ where a is in m/sec^2 and v is in m/sec, when $t = 0$, $v = 0$. Find the relation between v and t

1. $v = 9t^2$
2. $t = v/4$
3. $v^2 = 9t$
4. $t = 9v^2$

35. A particle of mass 10 kg is moving along the circumference of a circle of radius 10 m. If the tangential velocity of the particle is 5 m/sec, then the kinetic energy gained by the body in **10** rotations is

1. 500 J
2. 0 J
3. 400 J
4. 1250 J

36. The packing factor for y – iron is

1. **0.34**
2. 0.52
3. 0.68
4. 0.74

37. Which one among the following is a thermoset material?

1. Rubber
2. Nylon
3. Urea formaldehyde
4. Teflon

38. Which metal among the following would not undergo corrosion?

1. Copper
2. Gold
3. Silver
4. Iron

39. Domain structure is exhibited by

1. ferromagnets
2. paramagnets
3. diarnagnets
4. both dia and paramagnets

40. At absolute zero, the probability of occupation of energy levels below the Fermi energy level, by electrons, is

1. 1
2. 1/2
3. 1/3
4. 1/4

41. A water column of volume 6.5 litres is subjected to a direct pressure of $1.8\times10^{6}\ N/m^{2}$. Determine the change in volume of water column if the bulk modulus of water is taken as $2\times10^{9}\ N/mm^{2}$

1. $5.85\times10^{-6}\ m^{3}$
2. $58.5\times10^{-3}\ m^{3}$
3. $2.05\times10^{-4}\ m^{3}$
4. $1.85\times10^{-5}\ m^{3}$

42. Density index of a material is

1. greater than one
2. less than one
3. equal to one
4. indeterminate

43. The constituent of cement that imparts quick setting quality to cement is

1. Magnesia
2. Iron oxide
3. Alumina
4. Silica

44. A surveyor's mark cut on a stone or rock or any reference point to indicate a level in a levelling survey is called

1. reduced level
2. change point
3. levelling mark
4. bench mark

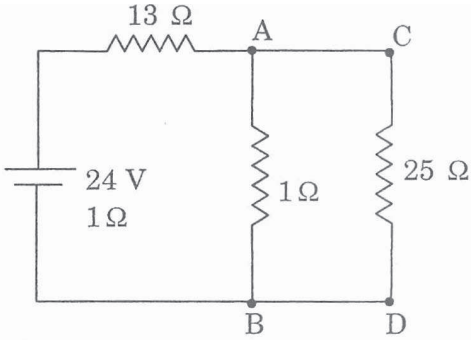
45. According to the United States Bureau of soil classification, the soil is designated as 'coarse clay' if the particle size varies from

1. 0.0001 mm to 0.002 mm
2. 0.02 mm to 0.06 mm
3. 0.2 mm to 0.6 mm
4. 0.6 mm to 2 mm

46. Two capacitors **A** and B are placed in series. Capacitors $C_A = 100\,\mu F$ and $C_B = 50\,\mu F$. The maximum energy stored in the circuit when 240 V, 50 Hz supply is applied to the circuit is

1. 19.2 J
2. 1.92 J
3. 192 J
4. 12.9 J

47. With reference to the network shown below, by applying Thevenin's theorem, find the equivalent voltage of the network when viewed from the terminals CD



1. 12 V
2. 6 V
3. 18 V
4. 21.5 V

48. "In a Delta/Star transformation of meshes, it must be remembered that the resistance of each arm of the star is given by the ———— of the resistance of the two delta sides that meet at its ends divided by the ———— of the three delta resistances."

1. product, product
2. sum, product
3. product, sum
4. sum, sum

49. An alternating voltage of $(8+j6)V$ is applied to a series a.c. circuit and the current passing is $(2+j5)A$. The impedance of the circuit is

1. 8.6 Ω
2. 18.6 Ω
3. 1.68 Ω
4. 1.86 Ω

50. A moving coil ammeter is wound with 40 turns and gives full scale deflection with 5 A. How many turns would be required on the same bobbin to give full scale deflection with 20 A?

1. 10
2. 40
3. 12
4. 21

51. The percentage of carbon in eutectoid steel is

1. 0.8
2. 0.4
3. 0.02
4. 1.2

52. Which one of the following is not using electron as a source of energy?

1. Solar cell
2. MHD generator
3. Fuel cell
4. Atomic power plant

53. Temporary metal forming process is

1. Welding
2. Brazing
3. Mechanical bonding
4. Soldering

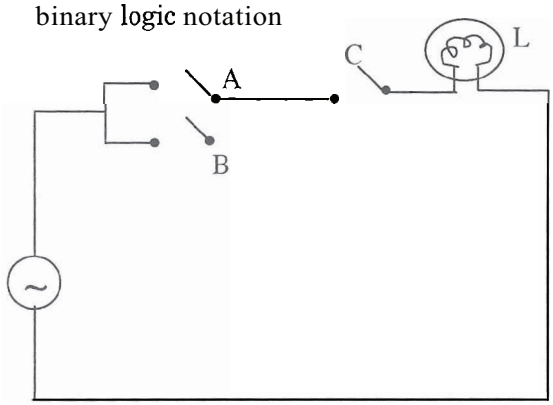
54. Under isobaric conditions, the Gibb's phase rule takes the form

1. $F = C - P + 2$
2. $F = C - P + 1$
3. $F = C - P + 3$
4. $F = C - P$

55. Which one of the following metals is more ductile?

1. Copper
2. Silver
3. Gold
4. Nickel

56. Express the following switching circuit in binary logic notation



1. $L = (AC + BC)$
2. $L = (A + B) \cdot C$
3. $L = (A + B) + C$
4. $L = A + (B + C)$

57. Applying DeMorgan's theorem find the equivalent of $(x + yz)'$

1. $(x' + y') \cdot z'$
2. $(x' + z') \cdot y'$
3. $(y' + x') + z'$
4. $x' \cdot (y' + z')$

58. LAN stands for

1. Local Access Network
2. Local Area Network
3. Link Access Network
4. Listed Area Network

59. An electronic semiconductor device that is fabricated with permanently stored information, which cannot be erased is called

1. Random Access Memory
2. Read Only Memory
3. Memory Data Register
4. Memory Address Register

60. Which of the following are the system directories in Unix?

1. / bin, / etc, / lib, / tmp
2. / local, / usr, / dev, / bin
3. / bash, / etc, / lib, / tmp
4. / sys, / dev, / bin, / usr

61. If θ is the angle between the vectors $\bar{a}$ and $\bar{b}$ such that $|\bar{a} \times \bar{b}| = \sqrt{10}$ and $\bar{a} \cdot \bar{b} = \sqrt{30}$, then the value of $\cos\theta$ is

1. $1/3$
2. $1/2$
3. $\frac{2}{\sqrt{3}}$
4. $\frac{\sqrt{3}}{2}$

62. If $a = \sqrt{2}i$, then which of the following is true?

1. $a = (\pm\sqrt{2})i$
2. $a + i = 1$
3. $a - i = 1$
4. $a = (-\&)i$

63. The value of the determinant given below is

$$A = \begin{vmatrix} \alpha^2 & a^3 & \alpha^4 \\ \alpha^3 & a^4 & \alpha^5 \\ a^4 & \alpha^6 & \alpha^7 \end{vmatrix}$$

1. a^9
2. α^{13}
3. $2\alpha^2$
4. 0

64. Which of the following points lies on the circle with centre $(3, -2)$ and radius 3 units?

1. $(3, 1)$
2. $(1, 3)$
3. $(-1, 3)$
4. $(-3, 1)$

65. A die and a coin are thrown together. The probability of obtaining a prime number on the die and tail on the coin is

1. $1/2$
2. $(1/2)^2$
3. $(1/2)^3$
4. $(1/2)^4$

66. Two coils connected in series have resistances of 600 Ω and *300* Ω and temperature coefficient of *0.001* and *0.004* respectively at 20° C. The resultant of the combination at 20° C is

1. *954* Ω
2. *549* Ω
3. *1094* Ω
4. *850* Ω

67. A boat is at rest under the action of three forces, two of which are $F_1 = 4i$ and $F_2 = 6j$. Then the z–component of the third force is

1. -4 units
2. -6 units
3. 0 units
4. -10 units

68. A body that absorbs all the radiation falling on it is called a

1. good absorber
2. perfect black body
3. black body
4. good emitter

69. Quantum nature of light is not supported by the phenomenon of

1. Compton effect
2. Photoelectric emission
3. Emission or absorption spectrum
4. Diffraction of light

70. Current carriers in an electrolyte are

1. electrons and negative ions
2. electrons and positive ions
3. positive and negative ions
4. electrons and ions

71. A real gas would approach the behaviour of an ideal gas at

1. low temperature and high pressure
2. low temperature and low pressure
3. high temperature and low pressure
4. high temperature and high pressure

72. Boron trifluoride (BF_3) will act as

1. a base
2. an acid
3. both as a base and an acid
4. neither a base nor an acid

73. An electric current is passed through an aqueous solution given below. Which one shall decompose?

1. Urea
2. Silver Nitrate
3. Ethyl alcohol
4. Glucose

74. The element of highest electronegativity is

1. Flourine
2. Chlorine
3. Oxygen
4. Caesium

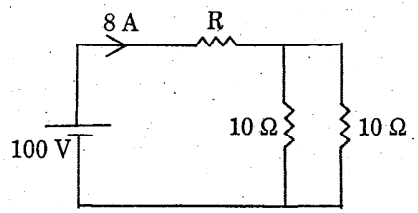
75. Which one of the following involves a polar bond?

1. Cl — Cl
2. O — O
3. Br — Br
4. H — Cl

PART 06 – ELECTRICAL, ELECTRONICS AND INSTRUMENTATION ENGINEERING

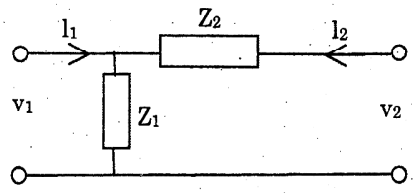
(Answer ALL questions)

76. In Fig., the value of R is



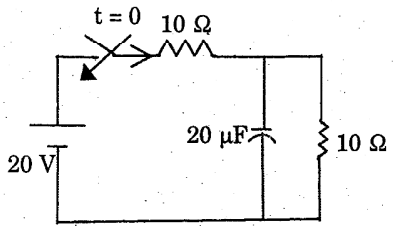
1) 2.5 Ω 2) 5.0 Ω
3) 7.5 Ω 4) 10.0 Ω

77. The RMS value of the voltage u(t)=3+4 cos(3t) is



1) $\sqrt{17}$V 2) 5 V
3) 7 V 4) $\left(3+2\sqrt{2}\right)$V

78. In Fig., the initial capacitor voltage is zero. The switch is closed at t=0. The final steady-state voltage across the capacitor is



1) 20 V 2) 10 V 3) 5 V 4) 0 V

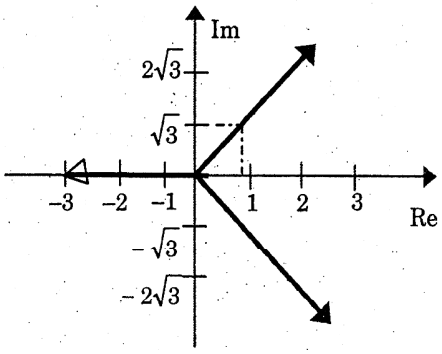
79. A system with zero initial conditions has the closed loop transfer function $T(s)=\frac{s^2+4}{(s+1)(s+4)}$. The system output is zero at the frequency.

1) 0.5 rad/sec 2) 1 rad/sec
3) 2 rad/sec 4) 4 rad/sec

80. A three-phase diode bridge rectifier is fed from a 400V RMS, 50 Hz, three-phase AC source. If the load is purely resistive, the peak instantaneous output voltage is equal to

1) 400 V 2) $400\sqrt{2}$V
3) $400\sqrt{\frac{2}{3}}$V 4) $\frac{400}{\sqrt{3}}$V

81. Fig. shows the root locus plot (location of poles not given) of a third order system whose open loop transfer function is

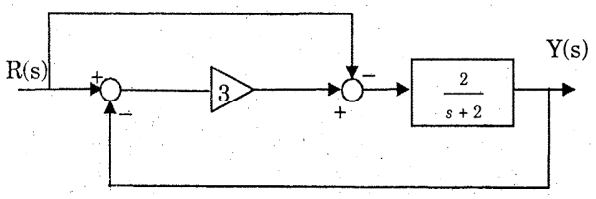


1) $\frac{K}{s^3}$ 2) $\frac{K}{s^2(s+1)}$
3) $\frac{K}{s(s^2+1)}$ 4) $\frac{K}{s(s^2-1)}$

82. A unity feedback system, having an open loop gain $G(s)H(s)=\frac{K(1-s)}{(1+s)}$, becomes stable when

1) $|K|>1$ 2) $K>1$
3) $|K|<1$ 4) $K<-1$

83. When subjected to a unit step input, the closed loop control system shown in Fig. will have a steady state error of



1) –1.0 2) –0.5
3) 0 4) 0.5

84. In the GH(s) plane, the Nyquist plot of the loop transfer function $G(s)H(s)=\frac{\pi e^{-0.25s}}{s}$ passes through the negative real axis at the point

1) (–0.25, j0) 2) (–0.5, j0)
3) (–1, j0) 4) (–2, j0)

85. The equivalent circuit of a transformer has leakage reactance X_1, X'_2 and magnetizing reactance X_M. Their magnitudes satisfy

1) $X_1 >> X'_2 >> X_M$
2) $X_1 << X'_2 << X_M$
3) $X_1 = X'_2 >> X_M$
4) $X_1 = X'_2 << X_M$

86. Which three-phase connection can be used in a transformer to introduce a phase difference of 30° between its output and corresponding input lines voltages?

1) Star-Star 2) Star–Delta
3) Delta-Delta 4) Delta-Zigzag

87. For an induction motor, operating at a slip s, the ratio of gross power output to air gap power is equal to

1) $(1-s)^2$ 2) $(1-s)$
3) $\sqrt{(1-s)}$ 4) $\left(1-\sqrt{s}\right)$

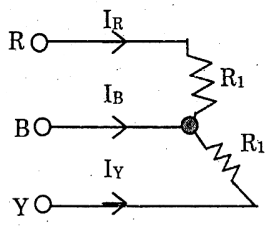
88. The p.u. parameters for a 500 MVA machine on its own base are.
inertia M=20 p.u.; reactance X=2 p.u.
The p.u. values of inertia and reactance on 100 MVA common base, respectively, are

1) 4, 0.4 2) 100, 10
3) 4, 10 4) 100, 0.4

89. An 800 kV transmission line has a maximum power transfer capacity operated at 400 kV with the series reactance unchanged, the new maximum power transfer capacity is approximately.

1) P 2) 2P
3) $\frac{P}{2}$ 4) $\frac{P}{4}$

90. For the three-phase circuit shown in Fig., the ratio of the current $I_g : I_y : I_B$ is given by



1) $1:1:\sqrt{3}$ 2) 1:1:2
3) 1:1:0 4) $1:1:\sqrt{\frac{3}{2}}$

91. The positive, negative and zero sequence impedances of a solidly grounded system under steady state condition always follow the relation

1) $z_1 > z_2 > z_0$ 2) $z_1 < z$
3) $z_0 < z_1 > z_2$ 4) None of the above

92. The relay operating coil is supplied through

1) Fuse 2) Power transformers
3) Instrument transformers 4) None of the above

93. The inertia constants of two groups of machines which do not swing together are M_1 and M_2. The equivalent inertia constant of the system is

1) M_1+M_2 2) $\sqrt{M_1+M_2}$
3) M_1M_2 / M_1+M_2 4) M_1+M_2 / M_1M_2

94. TRIAC is

1) a bidirectional thyristor
2) a combination of 2 PNPN diodes
3) another name for high power thyristor
4) a power BJT

95. An SCR can withstand a maximum temperature of 120°C with an ambient temperature of 75°C. If this SCR has thermal resistance from junction to ambient as 1.5°C/W, the maximum internal power dissipation allowed is

1) 90 W 2) 60 W 3) 30 W 4) 100 W

96. A microprocessor data bus has 16 lines and its address bus contains 12 lines. The number of bytes in the memory will be

1) 2K 2) 4K 3) 8K 4) 16K

97. The Q output of a JK flip flop is 'I'. The output does not change when the clock pulse is applied. The inputs J and K will be respectively (where 'x' - don't care state)

1) 0 and x 2) x and 0
3) 1 and 0 4) 0 and 1

98. Which one of the following will give the sum of full-adder as output?

1) Three input majority circuit
2) Three bit parity checker
3) Three bit comparator
4) Three bit counter

99. The frequency response of Chebyshev Type-I IIR filter has

1) a monotonic passband and stopband
2) a monotonic passband and ripples in the stopband
3) ripples in both passband and stopband
4) ripples in the passband and a monotonic stopband

100. The convolution of a function f(t) with unit impulse is

1) f(–t) 2) f(t) 3) δ(t) 4) δ(–t)

101. Minimum sampling rate when spectral range of a function extends from 10 MHz to 10.2 MHz is

1) 0.2 MHz 2) 0.4 MHz
3) 0.6 MHz 4) 0.8 MHz

102. Inverse Fourier transform of Sgn(ω) is

1) $-j / \pi t$ 2) $j / \pi t$ 3) $1 / \pi t$ 4) $-1 / \pi t$

103. The address field of a frame in HDLC protocol contains the address of the ––––– station.

1) secondary 2) primary
3) tertiary 4) repeater

104. The ––––– layer decides the location of synchronisation points.

1) network 2) transport
3) presentation 4) session

105. When the gain margin of the system is close to unity and the phase margin is close to zero, then the system is

1) highly stable 2) oscillatory
3) relatively stable 4) unstable

106. The characteristic equation of a system is $s^4+6s^3+11s^2+6s+k=0$. In order to ensure the system be stable, k must be

1) greater than zero and less than 10
2) less than zero and greater than 10
3) unity
4) zero

107. Diffraction of EM waves

1) is caused by reflection from the ground
2) rise only with spherical wavefronts
3) will occur when the waves pass through a large slot
4) may occur around the edge of a sharp obstacle

108. A quarter wave transformer is used for matching the transmission line to the load Z_L when Z_L is

1) high 2) low
3) purely resistive 4) complex

109. Frequencies in UHF range propagate by means of

1) ground waves 2) sky waves
3) space waves 4) surface waves

110. In a PCM, the amplitude levels are transmitted in a 7 unit code. The sampling is done at the rate of 10 KHz. The bandwidth should be

1) 35 KHz 2) 70 KHz 3) 5 MHz 4) 5 KHz

111. An open tank contains a liquid of varying density and the level within the tank must be accurately measured. The best choice of measuring system would be

1) Bubble tube
2) Diaphragm box
3) Float and cable
4) Head type with differential pressure transmitter

112. A lithium chloride element is usually calibrated to read

1) Relative humidity 2) Wet bulb temperature
3) Absolute humidity 4) Dew point

113. The purpose of using extension lead wires that have the same thermoelectric characteristics as the thermocouple is to

1) prevent corrosion at all junctions
2) extend the reference junction back to the instrument
3) prevent creating an unwanted reference junction
4) make the thermocouple system operate in standard fashion

114. The three factors that control the conductivity of an electrolyte are

1) specific gravity, density and volume
2) concentration, material in solution and temperature
3) color index, turbidity and temperature
4) Hydrogen ion concentration, temperature and pressure

115. An industrial effluent stream is to be neutralized by adding a sodium hydroxide solution. The best choice of analytical measurement for the control system would be

1) Conductivity
2) pH
3) Oxidation-reduction potential
4) Capacitance

116. The most popular carrier gas used in gas chromatograph is

1) Helium 2) Air
3) Hydrogen 4) Oxygen

117. Two inductive transducers working on the principle of change of self induction L, are connected in a push pull arrangement. If the change of inductance of transducer s is ΔL the change of inductance exhibited at the output terminal is

1) ΔL 2) $2\Delta L$ 3) $\pm 2\Delta L$ 4) 0

118. A true RMS reading voltmeter uses two thermocouples in order

1) to increase the sensitivity
2) that the second thermocouple cancels out the non linear effect of the first thermocouple
3) to prevent the drift in the D.C. amplifier
4) All of the above

119. The controlling torque in single phase power factor meter is provided by

1) Spring control 2) Gravity control
3) Stiffness of suspension 4) None of the above

120. Creeping in a single phase induction type energy meter may be due to

1) Overcompensation for friction
2) Over voltage
3) Vibration
4) All of the above

ELECTRICAL, ELECTRONICS AND INSTRUMENTATION ENGG.- : ANSWERS

76..... 3	77 1	78 2	79 3	80 2	81 1	82 3	83 3	84 2	85..... 4
86..... 2	87 2	88 4	89 4	90 1	91 1	92 2	93 1	94 1	95..... 3
96..... 2	97 2	98 1	99 4	100 2	101 1	102 1	103 1	104 4	105..... 1
106 1	107 4	108 4	109 1	110 4	111 4	112 1	113 4	114 2	115..... 2
116 1	117 4	118 2	119 1	120 4					

76. (2)

$$\frac{100}{R+5} = 8;\ R=7.5\ \Omega$$

77. (1)

$u(t) = 3+4\cos(3t)$ and $\omega=3$

$$T = \frac{2\pi}{3}$$

$$\text{RMS value of } u(t) = \sqrt{\frac{1}{T}\int_0^T \{u(t)\}^2}$$

$$= \sqrt{\frac{3}{2\pi}\int_0^{2\pi/3} (3+4\cos 3t)^2} = \sqrt{17}$$

78. (2)

At $t=0^+$, the capacitor is uncharged.

At steady state condition, capacitor is open circuited.

$$V_C(\infty) = \frac{20}{10+10}\times 10 = 10\ V$$

79. (3)

$$|T(j\omega)| = \frac{\left|(j\omega)^2+4\right|}{(j\omega+1)(j\omega+4)} = 0$$

$$-\omega^2+4 = 0$$

$$\omega = 2 \text{ rad/sec.}$$

80. (2)

Since load is purely resistive, peak instantaneous,

$$V_0 = \sqrt{2}\ V_{rms}$$

$$= 400\sqrt{2} \text{ volts}$$

81. (1)

$$G(S)\,H(S) = \frac{K}{S^3}$$

Characteristic equation is, $1+G(S)\,H(S)=0$

$$S^3+K = 0$$

$$\frac{dK}{dS} = 0$$

$$3S^2 = 0$$

$$S = 0, 0$$

In all other options, all breaking points are not at origin.

82. (3)

$$1+G(S)\,H(S) = 0$$

$$(1-K)S+(1+K) = 0$$

$$S(1-K)>0$$

$$(1+K)>0$$

$$|K|<1$$

83. (3)

$$M(S) = R(S)+[R(S)-Y(S)]\frac{3}{S}$$

$$Y(S) = \frac{2}{S+2}\left[R(S)\left[1+\frac{3}{S}\right]-\frac{3}{S}Y(S)\right]$$

$$\frac{Y(S)}{R(S)} = \frac{2(S+3)}{S^2+2S+6}$$

$$E(S) = R(S)-Y(S) = R(S)\left[1-\frac{2(S+3)}{S^2+2S+6}\right]$$

$$E(S) = R(S)\frac{S^2}{S^2+2S+6}$$

$$e_{SS} = \lim_{S\to 0} SE(S) = 0$$

84. (2)

$$G(s)\,H(s) = \frac{\pi e^{-0.25s}}{s}$$

$$G(js)\,H(jw) = \frac{\pi\left[\cos(0.25\omega)-j\sin(0.25\omega)\right]}{j\omega}$$

$$= \frac{-\pi}{\omega}\sin(0.25\omega) - j\frac{\pi}{\omega}\cos(0.25\omega)$$

Imaginary part = 0 ; $\frac{\pi}{\omega}\cos(0.25\omega) = 0$

$\frac{\omega}{4} = \frac{\pi}{2} \Rightarrow \omega = 2\pi$

$$\therefore \left|G(j\omega)H(j\omega)\right|_{\omega=2\pi} = \left|\frac{-\pi}{2\pi}\sin\left(\frac{2\pi}{4}\right)\right| = \left|\frac{-1}{2}\right| = -0.5$$

95. (3)

$$p_{max} = \frac{T_j - T_A}{\theta_j A} = \frac{120-75}{1.5} = 30\ W$$

96. (2)

$2^n = 2^{12} = 4k$

110. (4)

Bandwidth = $\frac{1}{2}$ sampling rate

PART 05 — ELECTRICAL, ELECTRONICS, COMMUNICATIONAND INSTRUMENTATION ENGINEERING

(Answer ALL questions)

76. How much energy is stored by a 100 mH inductance with a current of **1 A?**

1. 100 J
2. **1** J
3. 0.05 J
4. 0.01 J

77. If a network contains B branches and N nodes then the number of mesh current equations would be

1. $B-(N-1)$
2. $N-(B-1)$
3. B – N – 1
4. $(B+N)-1$

78. When $R=10\ \Omega, X_C=18\ \Omega$ and $X_L=12\ \Omega$, the current

1. leads the applied voltage
2. lags behind the applied voltage
3. is in phase with the voltage
4. is in quadrature with the voltage

79. In a certain series RC circuit, the true power is 2W and the reactive power is **3.5** VAR. What is the apparent power?

1. **3.5** VA
2. 2VA
3. 4.03 VA
4. 3VA

80. A sine wave voltage is applied across an inductor when the frequency of voltage is increased, the current

1. increases
2. decreases
3. remains the same
4. is zero

81. A shunt generator running at 1000 r.p.m. has generated e.m.f. as 200 V. If the speed increases to 1200 rpm, the generated emf will be nearly

1. 150 V
2. 175 V
3. 240 V
4. 290 V

82. In a d.c. generator in case the resistance of the field winding is increased then output voltage will

1. increase
2. decrease
3. remain unaffected
4. fluctuate heavily

83. D.C. motors are widely used in

1. Pump sets
2. Air compressors
3. Electric traction
4. Machine shops

84. The starting winding of a single-phase motor is placed in

1. armature
2. field
3. rotor
4. stator

85. An over-excited synchronous motor takes

1. leading current
2. lagging current
3. both (1) and (2)
4. in phase current

86. In open loop system the control action

1. depends on the size of the system
2. depends on system variables
3. depends on the input signal
4. is independent of the output

87. A controller is essentially a

1. Sensor
2. Clipper
3. Comparator
4. Amplifier

88. A signal flow graph is a

1. topological representation of a set of differential equations
2. polar graph
3. log log graph
4. special type of graph to analyse modern control systems

89. When the gain margin is positive and the phase margin is negative, the system is

1. stable
2. unstable
3. stable or unstable depending on the system
4. undeterministic

90. The effect of adding poles and zeros can be determined quickly by which of the following?

1. Root locus
2. Nyquist plot
3. Bode plot
4. Nicholar chart

91. A Norton's equivalent is

1. parallel circuit
2. series circuit
3. series-parallel circuit
4. none of the above

92. A resistor of 5 ohms is connected in one branch of a complex network. The current in this branch is 5 A. If this 5 Ω resistor is replaced by 10 Ω resistor the current in this branch will be

1. 10 A
2. 2.5 A
3. 5 A
4. less than 5 A

93. To determine the polarity of the voltage drop across a resistor, it is necessary to know the

1. value of the resistor
2. value of current through the resistor
3. direction of current through the resistor
4. power consumed by the resistor

94. In a network the number of tree branches

1. is equal to the number of links
2. cannot be equal to number of links
3. is twice the number of links
4. has no relation with the number of link branches

95. For a voltage source

1. the source emf and terminal voltage are equal
2. terminal voltage is always lower than source emf
3. terminal voltage cannot be higher than source emf
4. terminal voltage is zero

96. Kirchoffs voltage law states that the

1. total voltage drop in a series circuit is always finite
2. sum of emf and voltage drops in a closed mesh is zero
3. sum of emfs in a series circuit is zero
4. sum of emf and voltage drops in a closed mesh is not zero

97. In a thyristor, the magnitude of anode current will

1. increase if gate current is increased
2. decrease if gate current is decreased
3. increase if gate current is decreased
4. not change with variation in gate current

98. For an SCR, $\frac{di}{dt}$ protection is achieved through the use of

1. R in series with SCR
2. L in series with SCR
3. RL in series with SCR
4. RLC in series with SCR

99. Inverter gain is given by the ratio

1. dc output voltage/ac input voltage
2. ac output voltage/ac input voltage
3. dc output voltage/dc input voltage
4. ac output voltageldc input voltage

100. A zener diode works on the principle of

1. tunnelling of charge carriers across the junction
2. thermionic emission
3. diffusion of charge carriers across the junction
4. hoping of charge carriers across the junction

101. The major application of chopper drive is in

1. traction
2. computers
3. heating furnishes
4. miniature motors

102. When a thyristor gets turned on, the gate drive

1. should not be removed or it will turn off the SCR
2. may or may not be removed
3. should be removed
4. should be removed in order to avoid increased losses and higher function temperature

103. Computer cannot do anything without a

1. chip
2. memory
3. output device
4. program

104. The first computer made available for commercial use was

1. Mark–I
2. ENIAC
3. EDSAC
4. UNIVAC

105. When did Intel announce its 16-bit 80286 chip?

1. 1980
2. 1982
3. 1984
4. 1986

106. How many bits can be stored in the 8 K RAM?

1. 8000
2. 8192
3. 4000
4. 4096

107. The larger the RAM of a computer, the faster its processing speed is since it eliminates the

1. need of ROM
2. need for external memory
3. frequent disk I/Os
4. need for wider data path

108. Which of the following types of transducers can be used for measuring the angular position?

(a) Circular potentiometer
(b) LVDT
(c) E-Pick off
(d) Synchro

Select the correct answer using the codes given below :

1. (a), (b), (c) and (d)
2. (a) and (c)
3. (a), (b) and (d)
4. (a) and (d)

109. The most suitable thermocouple to be used for measuring temperature in the range of 1300° C to 1500" C is

1. Chromel–Constantan
2. Iron–Constantan
3. Chromel–Alumel
4. Platinum–Rhodium

110. LVDT is a

1. displacement transducer
2. velocity transducer
3. acceleration transducer
4. pressure transducer

111. In a strain measuring equipment using a resistance strain gauge the output quantity is

1. resistance
2. voltage
3. current
4. impedance

112. If the temperature increases by 100° C, the resistivity of a thermistor is likely to become

1. one half of initial value
2. one fiftieth of initial value
3. twice the initial value
4. no change

113. The purpose of duplexer is

1. to convert TDM to FDM
2. to provide same antenna both for transmission and reception
3. to convert pulsed transmission to CW transmission
4. both (1) and (3)

114. In FM transmission, amplitude of the modulating signal determines

1. rate of frequency variations

2. amount of frequency shift

3. total balance of transmission

4. distance of broadcast

115. The highest harmonic generated in human voice is

1. 1 kHz

2. 5 kHz

3. 3 kHz

4. 10 kHz

116. If the reflection coefficient of a line is zero, the line is

1. Infinite line

2. Open-circuited

3. Short-circuited

4. Very short line

117. The receiving antenna most commonly used for TV broadcasting in the UHF band is

1. turnstile antenna

2. dipole antenna

3. yagi antenna

4. rhombic antenna

118. Generally the aircraft electrical system uses supply frequency of

1. 50 Hz

2. 60 Hz

3. 400 Hz

4. 115 Hz

119. In GPS Navigation, there can be integration between

1. GPS and INS

2. GPS and LORAN C

3. GPS and ILS

4. GPS and DME

120. Mach Number is defined as the ratio between True air speed and speed of the sound at

1. sea level

2. any altitude

3. a particular altitude

4. all altitudes

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