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 – III Year/VI – Semester - Students Hand book – Even Semester of 2015 – 2016

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 – 2015 – 2016 (Even semester).
6. Class Time Table.
7. B.E. – EEE – Syllabus – VI Semester.
8. Lecture Schedule, Tutorial, Assignment questions.
9. Anna University question papers (Previous years).
10. Reminders on Placement and Career Guidance.
11. General Reminders.
12. All India installed capacity (in MV) of Power station.
13. Skill Development & Entrepreneurship program.
14. Developing Leadership Skills.
15. TANCET- Questions Paper.
16. Malpractices & Punishment in AU Examinations.
17. Bonafide Certificate & Leave Letter format.

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 and Electronics Engineering and allied applications.

MISSION

To produce excellent, innovative and Nationalistic Engineers with Ethical values and to advance in the field of Electrical and 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.

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 an 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

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, and welfare 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.

ANNA UNIVERSITY- CHENNAI
ACADEMIC CALENDER - Even Semester of 2015-2016

February 2016 – May 2016 (EVEN SEMESTER) SESSION OF THE
ACADEMIC YEAR 2015 – 2016
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	30.01.2016	30.04.2016	02.05.2016
2.	B.E. / B.Tech.(Full-Time)	II,IV,VI	01.02.2016	07.05.2016	09.05.2016
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/PT)	II,IV,VI			
6.	M.C.A. (Full-Time)	II,IV,VI			
7.	M.B.A. (FT/PT)	II,IV,VI			
8.	M.Sc (5 Yrs-Integrated)	II,IV,VI,VIII,X			
9.	M.Sc.(2 Yrs)	II,IV			

RE - OPENING DAY FOR THE NEXT SEMESTER: 04.07.2016 (Monday)

K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM POST - 630 612
ACADEMIC CALENDER - Even Semester of 2015-2016.
IV, VI & VIII SEMESTER UG & II, IV&VI SEMESTERPG DEGREE COURSES

S.No.	Date (Day)	*Programme / Events*	*Day*
		JANUARY '2016'	
1.	**01.01.16 (Friday)**	NEW YEAR – HOLIDAY- FOUNDERS DAY	-
2.	**15.01.16 (Friday)**	PONGAL - HOLIDAY	-
3.	**16.01.16 (Saturday)**	THIRUVALLUVAR THINAM- HOLIDAY	-
4.	**17.01.16(Sunday)**	ULAVAR THIRUNAAL - HOLIDAY	-
5.	**26.01.16(Tuesday)**	REPUBLIC DAY - HOLIDAY	-
6.	**28.01.16(Thursday)**	Commencement of classes- II,IV,VI &VIII -B.E./B. Tech (except EEE,ECE & /AUE- VIII semester)	**01**
7.	**30.01.16(Saturday)**	Commencement of classes- VIII semester (EEE, ECE & AUE) Monday order	**03**
		FEBRUARY '2016'	
8.	**01.02.16(Monday)**	Commencement of classes-II ,IV & VI sem –M.E /M.B.A / M.C.A Class committee meeting –I (1-5 Feb 2016) Students counselor meeting –I (1-5 Feb 2016)	**04**
9.	**15.02.16(Mon day)**	**Class Test –I (15th Feb -20th Feb 2016)**	**15**
10.	**29.02.16(Monday)**	CIT -1 – 29th Feb – 7th March 2016	**27**
		MARCH '2016'	
11.	**12.03.16 (Saturday)**	**Friday order 18th Graduation Day- Tentative**	**37**
12.	**18.03.16(Friday)**	Class Test –II -18th – 24th March 2016	**42**
13.	**24.03.16(Thursday)**	Sports Day - Tentative	**47**
14.	**25.03.16(Friday)**	GOOD FRIDAY – HOLIDAY	**-**
15.	**26.03.16(Saturday)**	Friday order Parents – Teachers Meeting	**48**
		APRIL '2016'	
16.	**06.04.16(Wednesday)**	International Conference on "Innovations in Engineering and Technology" – 6th & 7th April 2016 CIT-2 – 6th -13th April 2016	**56**
17.	**08.04.16(Friday)**	TELUGU NEW YEAR – HOLIDAY	**-**
18.	**14.04.16(Thursday)**	*TAMIL PUTTHANDU &* Dr.AMBEDKAR'S BIRTHDAY–HOLIDAY	**-**

19.	**15.04.16(Friday)**	Model Practical Examinations (15^{th} – 20^{th} April)	**62**
20.	**16.04.16(Saturday)**	Tuesday order 22^{nd} College Annual Day	**63**
21.	**19.04.16(Tuesday)**	MAHAVEER'S JEYANTHI – HOLIDAY	**-**
22.	**20.04.16(Wednesday)**	Students Feedback on faculty& College facility Course Outcome Survey- 20^{th} -23^{rd} April	**65**
23.	**21.04.16(Thursday)**	Class Test -3 – 21^{st} – 23^{rd} April 2016	**66**
24.	**25.04.16(Monday)**	Anna University Practical Examinations (25^{th} – 30^{th} April 2016) – Tentative	**69**
25.	**30.04.16(Saturday)**	Last working Day-VIII- Semester – B.E / B.Tech.,	**74**
MAY '2016'			
26.	**01.05.16(Sunday)**	MAY DAY – HOLIDAY	-
27.	**02.05.16(Monday)**	Commencement of Anna University – Theory Examinations- VIII semester –B.E / B.Tech.,	**75**
28.	**07.05.16(Saturday)**	Last working Day-II,IV& VI sem- all UG & PG courses	**80**
29.	**09.05.16(Monday)**	Commencement of Anna University –Theory Examinations- II,IV& VI sem -all UG & PG courses	-
30.	**10.05.16(Tuesday)**	Graduate Exit Survey -2016 passed out- survey to be completed on or before 31^{st} May 2016	-
31.	**11.05.16(Wednesday)**	Collection of Alumni, Employer Survey – survey to be completed on or before 10^{th} June 2016.	-

Commencement of classes : III, V, VII Semester – B.E./B.Tech., MCA, M.E, MBA : 04^{th} July 2016

K.L.N.COLLEGE OF ENGINEERING, POTTAPALAYAM-630612.
Department of Electrical and Electronics Engineering
CLASS WISE TIME TABLE -2015-2016 (EVEN)

Year/Sem/Sec : III / VI / A *Faculty In-charge : J.Merlin*

TIME / DAY	09.00 – 09.50	09.50 – 10.40	BREAK	10.55–11.45	11.45–12.35	LUNCH	01.15–02.05	02.05–02.55	02.55–03.45
MON	CE PKA	ES RJR		SSD RJPP	PST AM		PED LAB / MPMC LAB AM, MBL / JM, RJR		
TUE	PST AM	PSOC JM		DEM SMK	DEM SMK		ES RJR	SSD RJPP	CE PKA
WED	ES RJR	PST AM		PSOC JM	CE PKA		PED LAB / MPMC LAB AM, MBL / JM, RJR		
THU	PSOC JM	SSD RJPP		CE PKA	PSOC JM		DEM(T) SMK,RJR	PST AM	ES RJR
FRI	SSD RJPP	CE PKA		DEM SMK	PSOC JM		PSTS RJR, VS		

Year/Sem/Sec : III / VI / B *Faculty In-charge : M.Jeyamurugan*

TIME / DAY	09.00 – 09.50	09.50 – 10.40	BREAK	10.55–11.45	11.45–12.35	LUNCH	01.15–02.05	02.05–02.55	02.55–03.45
MON	PSOC CMS	PST AM		DEM SMK	DEM SMK		CE PKA	ES TG	SSD MJM
TUE	ES TG	CE PKA		PSOC CMS	PST AM		PED LAB / MPMC LAB MJM, NVRV / TG, EJ		
WED	CE PKA	SSD MJM		DEM SMK	DEM(T) SMK,MBL		ES TG	CE PKA	PSOC CMS
THU	PST AM	ES TG		SSD MJM	PSOC CMS		PED LAB / MPMC LAB MJM, NVRV / TG, EJ		
FRI	SSD MJM	PSOC CMS		PST AM	CE PKA		PSTS PKA, CMS		

Year/Sem/Sec : III / VI / C *Faculty In-charge : E.Jeyasri*

TIME / DAY	09.00 – 09.50	09.50 – 10.40	BREAK	10.55–11.45	11.45–12.35	LUNCH	01.15–02.05	02.05–02.55	02.55–03.45
MON	SSD SV	ES SM		DEM SMK	DEM SMK		PSOC KG	PST CMS	CE EJ
TUE	CE EJ	PED LAB MBL,MJM		/ MPMC LAB / EJ, TG			SSD SV	PSOC KG	ES SM
WED	PST CMS	CE EJ		DEM SMK	DEM(T) SMK,RJR		SSD SV	ES SM	CE EJ
THU	PSOC KG	PST CMS		SSD SV	PSOC KG		PSTS PKA, CMS		
FRI	ES SM	CE EJ		PSOC KG	PST CMS		PED LAB / MPMC LAB MBL, MJM / EJ, TG		

SUB CODE	SUBJECT NAME	ABBREVIATION	STAFF NAME		
			A – Sec	B – sec	C- Sec
EC6651	Communication Engineering	CE	P.K. Arunkumar	P.K. Arunkumar	E.Jeyasri
EE6601	Solid State Drives	SSD	R.Jeyapandi prathap	M.Jeyamurugan	Dr.S.Venkatesan
EE6602	Embedded Systems	ES	R. Jeyarohini	T.Gopu	S.Manoharan
EE6603	Power System Operation and Control	PSOC	J.Merlin	C.Muthamilselvi	Dr.K.Gnanambal
EE6604	Design of Electrical Machines (T)	DEM	Dr.S.M.Kannan	Dr.S.M.Kannan	Dr.S.M.Kannan
EE6002	Power System Transients (Elective I)	PST	A.Marimuthu	A.Marimuthu	C.Muthamilselvi
EE6611	Power Electronics and Drives Laboratory	PED LAB	A.Marimuthu	M.Jeyamurugan	M. Bharani lakshmi
EE6612	Microprocessors and Micro controllers Laboratory	MPMC LAB	J.Merlin	T.Gopu	E.Jeyasri
EE6613	Presentation Skills and Technical Seminar	PSTS	R. Jeyarohini	P.K. Arunkumar	P.K. Arunkumar

K.L.N. COLLEGE OF ENGINEERING

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SYLLABUS

EC6651 COMMUNICATION ENGINEERING L T P C

OBJECTIVES: 3 0 0 3

To introduce different methods of analog communication and their significance To introduce Digital Communication methods for high bit rate transmission

To introduce the concepts of source and line coding techniques for enhancing rating of transmission of minimizing the errors in transmission.

To introduce MAC used in communication systems for enhancing the number of users. To introduce various media for digital communication

UNIT I ANALOG COMMUNICATION 9

AM – Frequency spectrum – vector representation – power relations – generation of AM – DSB, DSB/SC, SSB, VSB AM Transmitter & Receiver; FM and PM – frequency spectrum – power relations : NBFM & WBFM, Generation of FM and DM, Amstrong method & Reactance modulations : FM & PM frequency.

UNIT II DIGITAL COMMUNICATION 9

Pulse modulations – concepts of sampling and sampling theormes, PAM, PWM, PPM, PTM, quantization and coding : DCM, DM, slope overload error. ADM, DPCM, OOK systems – ASK, FSK,

PSK, BSK, QPSK, QAM, MSK, GMSK, applications of Data communication.

UNIT III SOURCE CODES, LINE CODES & ERROR CONTROL (Qualitative only) 9

Primary communication – entropy, properties, BSC, BEC, source coding : Shaum, Fao, Huffman coding : noiseless coding theorum, BW – SNR trade off codes: NRZ, RZ, AMI, HDBP, ABQ, MBnBcodes : Efficiency of transmissions, error control codes and applications: convolutions & block codes.

UNIT IV MULTIPLE ACCESS TECHNIQUES 9

SS&MA techniques : FDMA, TDMA, CDMA, SDMA application in wire and wireless communication : Advantages (merits) :

UNIT V SATELLITE, OPTICAL FIBER – POWERLINE, SCADA 9

Orbits : types of satellites : frequency used link establishment, MA techniques used in satellite communication, earth station; aperture actuators used in satellite – Intelsat and Insat: fibers – types: sources, detectors used, digital filters, optical link: power line carrier communications: SCADA

TOTAL: 45 PERIODS

OUTCOMES:

Ability to understand and analyse, linear and digital electronic circuits.

TEXT BOOKS:

1. Taub & Schiling “Principles of Communication Systems” Tata McGraw Hill 2007.
2. J.Das “Principles of Digital Communication” New Age International, 1986.

REFERENCES:

1. Kennedy and Davis “Electronic Communication Systems” Tata McGraw hill, 4th Edition, 1993.
2. Sklar “Digital Communication Fundamentals and Applications“ Pearson Education, 2001.
3. Bary le, Memuschmidt, Digital Communication, Kluwer Publication, 2004.
B.P.Lathi “Modern Digital and Analog Communication Systems” Oxford University Press, 1998

EE6601 **SOLID STATE DRIVES** **L T P C**

3 0 0 3

OBJECTIVES:

To understand steady state operation and transient dynamics of a motor load system.

To study and analyze the operation of the converter/chopper fed dc drive, both qualitatively and quantitatively.

To study and understand the operation and performance of AC motor drives.

To analyze and design the current and speed controllers for a closed loop solid state DC motor drive.

UNIT I DRIVE CHARACTERISTICS **9**

Electric drive – Equations governing motor load dynamics – steady state stability – multi quadrant Dynamics: acceleration, deceleration, starting & stopping – typical load torque characteristics – Selection of motor.

UNIT II CONVERTER / CHOPPER FED DC MOTOR DRIVE **9**

Steady state analysis of the single and three phase converter fed separately excited DC motor drive–continuous and discontinuous conduction– Time ratio and current limit control – 4 quadrant operation of converter / chopper fed drive.

UNIT III INDUCTION MOTOR DRIVES **9**

Stator voltage control–energy efficient drive–v/f control–constant airgap flux–field weakening mode– voltage / current fed inverter – closed loop control.

UNIT IV SYNCHRONOUS MOTOR DRIVES **9**

V/f control and self control of synchronous motor: Margin angle control and power factor control – permanent magnet synchronous motor.

UNIT V DESIGN OF CONTROLLERS FOR DRIVES **9**

Transfer function for DC motor / load and converter – closed loop control with Current and speed feedback–armature voltage control and field weakening mode – Design of controllers; current controller and speed controller- converter selection and characteristics.

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. Gopal K.Dubey, Fundamentals of Electrical Drives, Narosa Publishing House, 1992.
2. Bimal K.Bose. Modern Power Electronics and AC Drives, Pearson Education, 2002.
3. R.Krishnan, Electric Motor & Drives: Modeling, Analysis and Control, Prentice Hall of India, 2001.

REFERENCES:

1. John Hindmarsh and Alasdain Renfrew, “Electrical Machines and Drives System,” Elsevier 2012.
2. Shaahin Felizadeh, “Electric Machines and Drives”, CRC Press(Taylor and Francis Group), 2013.
3. S.K.Pillai, A First course on Electrical Drives, Wiley Eastern Limited, 1993.
4. S. Sivanagaraju, M. Balasubba Reddy, A. Mallikarjuna Prasad “Power semiconductor drives” PHI, 5th printing, 2013.
5. N.K.De., P.K.SEN”Electric drives” PHI, 2012.

Vedam Subramanyam, ”Thyristor Control of Electric Drives”, Tata McGraw Hill, 2007

EE6602 **EMBEDDED SYSTEMS** **LT P C**
3 0 0 3

OBJECTIVES:

To introduce the Building Blocks of Embedded System

To Educate in Various Embedded Development Strategies

To Introduce Bus Communication in processors, Input/output interfacing. To impart knowledge in Various processor scheduling algorithms.

To introduce Basics of Real time operating system and example tutorials to discuss on one real-time operating system tool

UNIT I INTRODUCTION TO EMBEDDED SYSTEMS 9

Introduction to Embedded Systems – The build process for embedded systems- Structural units in Embedded processor , selection of processor & memory devices- DMA – Memory management methods- Timer and Counting devices, Watchdog Timer, Real Time Clock, In circuit emulator, Target Hardware Debugging.

UNIT II EMBEDDED NETWORKING 9

Embedded Networking: Introduction, I/O Device Ports & Buses– Serial Bus communication protocols - RS232 standard – RS422 – RS485 - CAN Bus -Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I^2C) –need for device drivers.

UNIT III EMBEDDED FIRMWARE DEVELOPMENT ENVIRONMENT 9

Embedded Product Development Life Cycle- objectives, different phases of EDLC, Modelling of EDLC; issues in Hardware-software Co-design, Data Flow Graph, state machine model, Sequential Program Model, concurrent Model, object oriented Model.

UNIT IV RTOS BASED EMBEDDED SYSTEM DESIGN 9

Introduction to basic concepts of RTOS- Task, process & threads, interrupt routines in RTOS, Multiprocessing and Multitasking, Preemptive and non-preemptive scheduling, Task communication-shared memory, message passing-, Inter process Communication – synchronization between processes-semaphores, Mailbox, pipes, priority inversion, priority inheritance, comparison of Real time Operating systems: Vx Works, чC/OS-II, RT Linux.

UNIT V EMBEDDED SYSTEM APPLICATION DEVELOPMENT 9

Case Study of Washing Machine- Automotive Application- Smart card System Application,.

TOTAL: 45 PERIODS

OUTCOMES:

Ability to understand and analyse, linear and digital electronic circuits.

TEXT BOOKS:

1. Rajkamal, ‘Embedded System-Architecture, Programming, Design’, Mc Graw Hill, 2013.
2. Peckol, “Embedded system Design”, John Wiley & Sons,2010
3. Lyla B Das,” Embedded Systems-An Integrated Approach”, Pearson, 2013

REFERENCES:

1. Shibu. K.V, “Introduction to Embedded Systems”, Tata Mcgraw Hill,2009.
2. Elicia White,” Making Embedded Systems”, O’ Reilly Series,SPD,2011.
3. Tammy Noergaard, “Embedded Systems Architecture”, Elsevier, 2006.
4. Han-Way Huang, ”Embedded system Design Using C8051”, Cengage Learning,2009.

Rajib Mall “Real-Time systems Theory and Practice” Pearson Education, 2007

EE6603 POWER SYSTEM OPERATION AND CONTROL L T P C

OBJECTIVES: 3 0 0 3

- To have an overview of power system operation and control.
- To model power-frequency dynamics and to design power-frequency controller.
- To model reactive power-voltage interaction and the control actions to be implemented for maintaining the voltage profile against varying system load.
- To study the economic operation of power system.
- To teach about SCADA and its application for real time operation and control of power systems.

UNIT I INTRODUCTION 9

An overview of power system operation and control - system load variation - load characteristics - load curves and load-duration curve - load factor - diversity factor - Importance of load forecasting and quadratic and exponential curve fitting techniques of forecasting – plant level and system level controls .

UNIT II REAL POWER - FREQUENCY CONTROL 9

Basics of speed governing mechanism and modeling - speed-load characteristics – load sharing between two synchronous machines in parallel - control area concept - LFC control of a single-area system - static and dynamic analysis of uncontrolled and controlled cases - two-area system – modeling - static analysis of uncontrolled case - tie line with frequency bias control - state variable model - integration of economic dispatch control with LFC.

UNIT III REACTIVE POWER–VOLTAGE CONTROL 9

Generation and absorption of reactive power - basics of reactive power control - excitation systems – modeling - static and dynamic analysis - stability compensation - methods of voltage control: tap-changing transformer, SVC (TCR + TSC) and STATCOM – secondary voltage control.

UNIT IV UNIT COMMITMENT AND ECONOMIC DISPATCH 9

Formulation of economic dispatch problem – I/O cost characterization – incremental cost curve - co-ordination equations without and with loss (No derivation of loss coefficients) - solution by direct method and λ-iteration method - statement of unit commitment problem – priority-list method - forward dynamic programming.

UNIT V COMPUTER CONTROL OF POWER SYSTEMS 9

Need for computer control of power systems - concept of energy control centre - functions - system monitoring - data acquisition and control - system hardware configuration – SCADA and EMS functions - network topology - state estimation – WLSE - Contingency Analysis - state transition diagram showing various state transitions and control strategies.

TOTAL : 45 PERIODS

OUTCOMES:

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

TEXT BOOKS:

1. Olle.I.Elgerd, 'Electric Energy Systems theory - An introduction', Tata McGraw Hill Education Pvt. Ltd., New Delhi, 34th reprint, 2010.
2. Allen. J. Wood and Bruce F. Wollenberg, 'Power Generation, Operation and Control', John Wiley & Sons, Inc., 2003.
3. Abhijit Chakrabarti, Sunita Halder, 'Power System Analysis Operation and Control', PHI learning Pvt. Ltd., New Delhi, Third Edition, 2010

REFERENCES:

1. Nagrath I.J. and Kothari D.P., 'Modern Power System Analysis', Tata McGraw-Hill, Fourth Edition, 2011.
2. Kundur P., 'Power System Stability and Control, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 10th reprint, 2010.
3. Hadi Saadat, 'Power System Analysis', Tata McGraw Hill Education Pvt. Ltd., New Delhi, 21st reprint, 2010.
4. N.V.Ramana, "Power System Operation and Control," Pearson, 2011.
5. C.A.Gross, "Power System Analysis," Wiley India, 2011

EE6604 DESIGN OF ELECTRICAL MACHINES LT P C
3 1 0 4

OBJECTIVES:

To study mmf calculation and thermal rating of various types of electrical machines. To design armature and field systems for D.C. machines.

To design core, yoke, windings and cooling systems of transformers. To design stator and rotor of induction machines.

To design stator and rotor of synchronous machines and study their thermal behaviour.

UNIT I INTRODUCTION 9

Major considerations in Electrical Machine Design - Electrical Engineering Materials – Space factor – Choice of Specific Electrical and Magnetic loadings - Thermal considerations - Heat flow – Temperature rise and Insulating Materials - Rating of machines – Standard specifications.

UNIT II DC MACHINES 9

Output Equations – Main Dimensions – Choice of Specific Electric and Magnetic Loading - Maganetic Circuits Calculations - Carter's Coefficient - Net length of Iron –Real & Apparent flux densities – Selection of number of poles – Design of Armature – Design of commutator and brushes – performance prediction using design values.

UNIT III TRANSFORMERS 9

Output Equations – Main Dimensions - kVA output for single and three phase transformers – Window space factor – Design of core and winding – Overall dimensions – Operating characteristics – No load current – Temperature rise in Transformers – Design of Tank - Methods of cooling of Transformers.

UNIT IV INDUCTION MOTORS 9

Output equation of Induction motor – Main dimensions – Choice of Average flux density– Length of air gap- Rules for selecting rotor slots of squirrel cage machines – Design of rotor bars & slots – Design of end rings – Design of wound rotor – Magnetic leakage calculations – Leakage reactance of polyphase machines- Magnetizing current - Short circuit current – Operating characteristics- Losses and Efficiency.

UNIT V SYNCHRONOUS MACHINES 9

Output equations – choice of Electrical and Magnetic Loading – Design of salient pole machines – Short circuit ratio – shape of pole face – Armature design – Armature parameters – Estimation of air gap length – Design of rotor –Design of damper winding – Determination of full load field mmf – Design of field winding – Design of turbo alternators – Rotor design.

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

OUTCOMES:

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

TEXT BOOKS:

1. Sawhney, A.K., 'A Course in Electrical Machine Design', Dhanpat Rai & Sons, New Delhi, 1984.
2. M.V.Deshpande "Design and Testing of Electrical Machine Design" Wheeler Publications, 2010.

REFERENCES:

1. A.Shanmuga Sundaram, G.Gangadharan, R.Palani 'Electrical Machine Design Data Book', New Age International Pvt. Ltd., Reprint, 2007.
2. R.K.Agarwal " Principles of Electrical Machine Design" Esskay Publications, Delhi, 2002.
3. Sen, S.K., 'Principles of Electrical Machine Designs with Computer Programmes', Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1987.

EE6002 POWER SYSTEM TRANSIENTS LT P C
3 0 0 3

OBJECTIVES:

To study the generation of switching transients and their control using circuit – theoretical concept. To study the mechanism of lighting strokes and the production of lighting surges.

To study the propagation, reflection and refraction of travelling waves.

To study the impact of voltage transients caused by faults, circuit breaker action, load rejection on integrated power system.

UNIT I INTRODUCTION AND SURVEY 9

Review and importance of the study of transients - causes for transients. RL circuit transient with sine wave excitation - double frequency transients - basic transforms of the RLC circuit transients. Different types of power system transients - effect of transients on power systems – role of the study of transients in system planning.

UNIT II SWITCHING TRANSIENTS 9

Over voltages due to switching transients - resistance switching and the equivalent circuit for interrupting the resistor current - load switching and equivalent circuit - waveforms for transient voltage across the load and the switch - normal and abnormal switching transients. Current suppression - current chopping - effective equivalent circuit. Capacitance switching - effect of source regulation - capacitance switching with a restrike, with multiple restrikes. Illustration for multiple restriking transients - ferro resonance.

UNIT III LIGHTNING TRANSIENTS 9

Review of the theories in the formation of clouds and charge formation - rate of charging of thunder clouds – mechanism of lightning discharges and characteristics of lightning strokes – model for lightning stroke - factors contributing to good line design - protection using ground wires - tower footing resistance - Interaction between lightning and power system.

UNIT IV TRAVELING WAVES ON TRANSMISSION LINE COMPUTATION OF TRANSIENTS 9

Computation of transients - transient response of systems with series and shunt lumped parameters and distributed lines. Traveling wave concept - step response - Bewely's lattice diagram - standing waves and natural frequencies - reflection and refraction of travelling waves.

UNIT V TRANSIENTS IN INTEGRATED POWER SYSTEM 9

The short line and kilometric fault - distribution of voltages in a power system - Line dropping and load rejection - voltage transients on closing and reclosing lines - over voltage induced by faults -switching surges on integrated system Qualitative application of EMTP for transient computation.

TOTAL : 45 PERIODS

OUTCOMES:

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

TEXT BOOKS:

1. Allan Greenwood, 'Electrical Transients in Power Systems', Wiley Inter Science, New York, 2nd Edition, 1991.
2. Pritindra Chowdhari, "Electromagnetic transients in Power System", John Wiley and Sons Inc., Second Edition, 2009.
3. C.S. Indulkar, D.P.Kothari, K. Ramalingam, 'Power System Transients – A statistical approach', PHI Learning Private Limited, Second Edition, 2010.

REFERENCES:

1. M.S.Naidu and V.Kamaraju, 'High Voltage Engineering', Tata McGraw Hill, Fifth Edition, 2013.
2. R.D. Begamudre, 'Extra High Voltage AC Transmission Engineering', Wiley Eastern Limited, 1986.
3. Y.Hase, Handbook of Power System Engineering," Wiley India, 2012.

J.L.Kirtley, "Electric Power Principles, Sources, Conversion, Distribution and use," Wiley, 2012

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

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

Degree/Program : **B.E./EEE** Course Name : **COMMUNICATION ENGINEERING** Duration : **January '16 to April'16** Course Code : **EC6651**
Semester : **VI** Section :**A, B & C**
Regulation : **2013 / AUC** Staff : **P.K.Arun Kumar** (A &B Sec) & **E.Jeyasri** (C Sec)

AIM :

- To introduce the concepts of communication systems engineering using wire and wireless medium

OBJECTIVES:

- To introduce different methods of analog communication and their significance
- To introduce Digital Communication methods for high bit rate transmission
- To introduce the concepts of source and line coding techniques for enhancing rating of transmission of minimizing the errors in transmission.
- To introduce MAC used in communication systems for enhancing the number of users.
- To introduce various media for digital communication

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

CO	Course Outcomes	POs	PSOs
C310.1	Explain the operation of Amplitude Modulation , draw the frequency spectrum and vector representation of AM	1,2,3,4,5,7,11	1,2,3
C310.2	Compare the different methods of QPSK, BFSK and GMSK	1,2,3,4,5,6	1,3
C310.3	Analyze how information is transmitted to receiver using the Huffman coding	1,2,3,6,7	1,3
C310.4	Discuss about the various types of multiple access techniques	1,3,4,5,	1,2
C310.5	Distinguish between INTELSAT and INSAT	1,2,3,5,11	1,2

S.No	Date	Period Number	Topics to be Covered	Book No [Page No]
UNIT I: ANALOG COMMUNICATION				**Target Periods : 10**
1			AM – Frequency spectrum	R6(2.1)
2			Vector representation - power relations	R6(2.5),(2.10)
3			Generation of AM –DSB	R6(3.1),(4.1)
4			DSB/SC, SSB	R6(4.2),(4.11)
5			VSB AM Transmitter & Receiver	R6(4.21),(5.1),(5.3)
6			FM and PM – frequency spectrum	R6(6.1)
7			Power relations : NBFM & WBFM	R6(6.13),(6.14)
8			Generation of FM and DM	R6(7.1),(3.7)
9			Armstrong method & Reactance Modulations: FM & PM frequency.	R6(7,5),(7.2)
10			Unit-1 Revision, NPTEL Video – Unit-I	
11			NPTEL Video – Unit-I	
12			Anna University important Part-A & Part-B Questions Discussion – Unit-1	
Total Periods:		**12**	***Assignment - 1 Date of Announcement :_____ Date Of Submission :*** ***Class Test-1 on _____ Test Portion:Unit-1***	
UNIT II: DIGITAL COMMUNICATION				**Target Periods : 10**
13			Pulse modulations ,concepts of sampling and sampling theormes	R6(1.1),(1.2)
14			PAM, PWM	R6((1.7),(1.14)
15			PPM, PTM	R6(1.18),(1.14)
16			Quantization and Coding – DCM	R6(2.4),(2.16),(2.1)
17			DM, slope overload error	R6(3.4),(3.7)
18			ADM, DPCM, OOK systems	R6(3.9),(3.1)

19			ASK, FSK, PSK	R6(4.5),(4.8),(4.13)
S.No	**Date**	**Period Number**	**Topics to be Covered**	**Book No [Page No]**
20			BSK, QPSK, QAM	R6(4.14),(4.19) (4.26)
21			MSK, GMSK, applications of Data communication	R6(4.29),(4.34)
22			Unit-2 Revision, NPTEL Video – Unit-II	
23			NPTEL Video – Unit-II	
24			Anna Univ**e**rsity important Part-A & Part-B Questions Discussion – Unit-2	
Total Periods:		**12**	***CIT-1 on _____***	***Test Portion:Unit-1&2***
UNIT III: SOURCE CODES, LINE CODES & ERROR CONTROL *(Qualitative only)*				**Target Periods : 9**
25			Primary communication – entropy, properties	R6(1.1),(1.3),(1.5)
26			BSC, BEC,	R6(1.20),(1.21)
27			source coding : Shaum, Fao,	R6(2.1),(2.3)
28			Huffman coding : noiseless coding theorem	R6(2.7),(2.12)
29			BW – SNR trade off codes: NRZ	R6(3.1),(3.5)
30			RZ, AMI	R6(3.7)(3.10)
31			HDBP, ABQ	R6((3.12)
32			MBnB codes : Efficiency of transmissions	R6(3.12)(3.17)
33			Error control codes and applications: convolutions & block codes	R6(4.1),(4.2),(4.6)
34			Unit-3 Revision & Anna Univ**e**rsity important Part-A & Part-B Questions Discussion – Unit-3	
Total Periods:		**10**	***Assignment -2 Date of Announcement : _____ Date Of Submission : Class Test-2 on _____ Test Portion:Unit-3***	
UNIT IV: MULTIPLE ACCESS TECHNIQUES				**Target Periods : 9**
35			SS&MA techniques	R6(1.1),(2.1) R6(2.6)
36				
37			FDMA	R6(2.9)
38			TDMA	R6(2.14)
39				
40			CDMA	R6(1.1),(2.1) R6(2.6)
41				
42			SDMA	R6(2.9)
43			Application in wire and wireless communication: Advantages (merits)	Material
44			Unit-4 Revision & Anna Univ**e**rsity important Part-A & Part-B Questions Discussion – Unit-4	
Total Periods:		**10**	***CIT-II on _____***	***Test Portion:Unit-3 &4***
UNIT V: SATELLITE, OPTICAL FIBER – POWERLINE, SCADA				**Target Periods : 9**
45			Orbits: types of satellites	R6(1.2),(1.4)
46				
47			Frequency used link establishment	R6(1.7)
48			MA techniques used in satellite communication	R6(1.9)
49			Earth station ,Aperture actuators used in satellite	R6(1.25)
50			Intelsat and Insat	R6(1.29),(1.34)
51			Fibers –types: sources, detectors used digital filters	R6(2.1),(2.6),(2.12) (2.16)&(2.24)
52				
53			Optical link: power line carrier communications: SCADA	R6(2.32)
54			Unit-5 Revision & Anna Univ**e**rsity important Part-A & Part-B Questions Discussion – Unit-5	
Total Periods:		**10**	***Assignment -3 Date of Announcement :_____ Date Of Submission : Class Test-3 on _____ Test Portion:Unit-5***	

			CONTENT BEYOND THE SYLLABUS	***Target Periods: 02***
55			Commercial applications of Bluetooth	Material
56				
			QUIZZES	**Target Periods: 02**
57			Quizzes –I – Unit-1,2	
58			Quizzes –II – Unit-3,4&5	
			SEMINAR	**Target Periods: 04**
59			Global System for Mobile communication (GSM) & Near field communication (NFC) – Seminar -1	
60				
61			Wireless Fidelity (Wi-Fi) & MATLAB applications to Communication systems – Seminar -2	
62				

Text Book / Reference

S. No		Title of the Book	Author	Publisher	Year
1	**T1**	Principles of communication systems	Taub & Schiling	Tata McGraw hill	2007
2	**T2**	Principles of Digital communication	Das J	New Age International	1986
3	**R1**	Electronic communication systems	Kennedy and Davis	Tata McGraw hill, 4th edition	1993
4	**R2**	Digital communication fundamentals and applications	Sklar	Pearson Education	2001
5	**R3**	Digital Communication	Baryle, Memuschmidt	Kluwer Publication	2004
6	**R4**	Electronic communication systems	Wayne Tomasi	Pearson Education	2009
7	**R5**	Modern digital and analog communication systems	Lathi B.P	Oxford University Press	1998
8	**R6**	Communication Engineering	K.Muralibabu	Lakshmi Publications	2013

Website Reference

- http://en.wikipedia.org/wiki/Analog_modulation
- http://people.brunel.ac.uk/~eestprh/EE5514/lesson5_new.pdf
- http://www.jisc.ac.uk/whatwedo/themes/network/sat/report3.aspx
- http://nptel.ac.in/video.php?subjectId=117102059

STAFF INCHARGE **HOD/EEE**

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

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

Department of Electrical and Electronics Engineering

Lecture Schedule

Degree/Programme : **B.E / EEE** Semester: **VI** Section: **A, B & C**

Course code & Name: **EE6601 & SOLID STATE DRIVES** Duration: **Jan-Apr 2016.**

Regulation: **2013/AUC** Staff: **Dr.S.VENKATESAN, M.JEYAMURUGAN & R. JEYAPANDIPRATHAP**

AIM: To study and understand the operation of electric drives controlled from a power electronic converter and to introduce the design concepts of controllers.

OBJECTIVES:

- To understand steady state operation and transient dynamics of a motor load system.
- To study and analyze the operation of the converter/chopper fed dc drive, both qualitatively and quantitatively.
- To study and understand the operation and performance of AC motor drives.
- To analyze and design the current and speed controllers for a closed loop solid state DC motor drive.

Prerequisites: Electronic Devices and Circuits, Electrical machines, Power Electronics

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

COs	Course Outcomes	POs	PSOs
C311.1	Classify the various types of drives and load torque characteristics and Apply the multi quadrant dynamics in hoist load system.	1	1
C311.2	Analyze the operation of steady state analysis of single phase and three phase fully controlled converter and Chopper fed separately excited dc motor drives and discuss the various control strategies of converter.	1,2,3,4	1
C311.3	Explain the operation and characteristics of various methods of solid state speed control of induction motor.	1,2	1
C311.4	Describe the operation of various modes of V/f control of synchronous motor drives and different types of permanent magnet synchronous motor drives.	1	1
C311.5	Design a current and speed controller and develop the transfer function for DC motor, load and converter, closed loop control with current and speed feedback.	1,2,3,4	1

Total : 45 Periods

S. No	Date	Period Number	Topics to be Covered	Book No [Page No]	
UNIT - I: DRIVE CHARACTERISTICS					**Target Periods : 9**
1			Electrical Drives - Introduction	T1[1]	R7[1.1]
2			General Electric Drive System	T1[3]	R7[1.4]
3			Equations governing motor load dynamics	T1[11]	R7[1.8]
4			Steady state stability	T1[23]	R7[1.19]
5			Multi quadrant dynamics	T1[12]	R7[1.13]
6			Acceleration including starting,	T1[32]	R7[1.21]
7			Deceleration including stopping		R7[1.23]
8			Typical Load Torque Characteristics	T1[18]	R7[1.24]
9			Selection of motor, Revision	T1[44]	R7[1.4]
Total Periods:		**9**	***Assignment - I***	*Date of Submission :*	
			Test – I: Class Test-I	***Portion :*** *Unit – 1*	
UNIT – II: CONVERTER/CHOPPER FED DC MOTOR DRIVE					**Target Periods : 9**
10			Controlled rectifier fed DC Motor drive	T1[97]	R7[2.1]
11			Steady state analysis of the single phase half controlled converter fed separately excited DC motor drive-Continuous conduction mode	T1[109]	R7[2.32]
12			Steady state analysis of the single phase half controlled converter fed separately excited DC motor drive-Discontinuous conduction mode	T1[107]	R7[2.36]
13			Steady state analysis of the single phase full controlled converter fed separately excited DC motor drive-Continuous conduction mode	T1[100]	R7[2.47]
14			Steady state analysis of the single phase full controlled converter fed separately excited DC motor drive-Discontinuous conduction mode	T1[98]	R7[2.45]
15			Steady state analysis of the three phase half & fully controlled converter fed separately excited D.C motor drive	T1[111]	R7[2.80,A3]
16			Chopper fed D.C motor drive -Time ratio and current limit control	T1[121]	R7[3.1]

17			Four quadrant operation of converter fed drive	T1[114]	R7[2.91]
18			Four quadrant operation of chopper fed drive, Revision	T1[122]	R7[3.37]
Total Periods:		**9**	***Assignment - II***	*Date of Submission :*	
		1,2	***Test – II: CIT-I***	***Portion :*** *Unit – 1,II*	
UNIT – III: INDUCTION MOTOR DRIVES					**Target Periods : 9**
19			Stator voltage control	T1[183]	R7[5.23]
20			Energy efficient drive	T1[218]	R7[A.11]
21			Static Kramer Drive-Static Scherbius Drive	T1[221]	R7[5.159]
22			V/f control	T1[186]	R7[5.63]
23			Constant air-gap flux control	-	R7[5.75]
24			Field weakening mode	-	R7[5.78]
25			VSI fed Induction motor drive	T1[191]	R7[5.79]
26			CSI fed Induction motor drive	T1[206]	R7[5.86]
27			Closed loop control, Revision	T1[198,208]	R7[5.88]
28			Seminar-I	-	-
29			Quiz-I	-	-
Total Periods:		**9**	***Test – III : Class Test-II***	***Portion :*** *Unit – III*	
UNIT – IV: SYNCHRONOUS MOTOR DRIVES					**Target Periods : 9**
30			Introduction-Synchronous Motor	T1[244]	R7[6.1]
31			Synchronous motor Variable Speed Drives	T1[256]	R7[6.8]
32			V/f control of synchronous motor	T1[256]	R7[6.8]
33			Self-control of synchronous motor drive a load commutated thyristor inverter	T1[260]	R7[6.9]
34			Self-controlled synchronous motor drive employing a cycloconverter	T1[267]	R7[6.20]
35			Marginal angle control	T1[263]	R7[6.13]
36			Power factor control	-	R7[6.22]
37			Permanent magnet synchronous motor	T1[267]	R7[6.22]
38			Revision		
39			Seminar-II	-	-
40			Quiz-II	-	-
Total Periods:		**9**	***Assignment - III***	*Date of Submission :*	
			Test – IV: CIT-II	***Portion :*** *Unit – III, IV*	
UNIT – V: DESIGN OF CONTROLLERS FOR DRIVES					**Target Periods : 9**
41			Transfer function for DC motor / load	-	R7[4.5]
42			Transfer function for DC motor / converter	-	R7[4.12]
43			Closed loop control with current feedback	T1[35]	R7[4.2]
44			Closed loop control with speed feedback	T1[36]	R7[4.3]
45			Closed loop control with armature voltage control and field weakening mode	-	R7[4.4]
46			Design of controllers: Current controller	-	R7[4.19]
47			Design of controllers: speed controller	-	R7[4.15]
48			Converter selection and characteristics	-	R7[4.28]
49			Revision	-	-
Total Periods:		**9**	***Test – V: Class Test-III***	***Portion :*** *Unit – V*	
50			**Content beyond Syllabus**	-	-
51			**NPTEL**	-	-

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

S. No		Title of the Book	Author	Publisher	Year
1	T1	Fundamentals of Electrical Drives	Gopal K.Dubey	Narosa Publishing House	1992
2	T2	Modern Power Electronics and AC Drives	Bimal K.Bose	Pearson Education	2002
3	T3	Electric Motor & Drives: Modeling, Analysis and Control	R.Krishnan	Prentice Hall of India	2001
4	R1	Electrical Machines and Drives System	John Hindmarsh and Alasdain Renfrew	Elsevier	2012
5	R2	Electric Machines and Drives	Shaahin Felizadeh	CRC Press(Taylor and Francis Group)	2013
6	R3	A First course on Electrical Drives	S.K.Pillai	Wiley Eastern Limited	1993
7	R4	Power semiconductor drives	S. Sivanagaraju, M. Balasubba Reddy, A. Mallikarjuna Prasad	PHI, 5th printing	2013
8	R5	Electric drives	N.K.De., P.K.SEN	PHI	2012
9	R6	Thyristor Control of Electric Drives	Vedam Subramanyam	Tata McGraw Hill	2007

10	R7	Solid State Drives	J. Gnanavadivel	Anuradha	2015

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

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C311.1	3	-	-	-	-	-	-	-	-	-	-	-	1	-	-
C311.2	3	2	1	3	-	-	-	-	-	-	-	-	3	-	-
C311.3	3	1	-	-	-	-	-	-	-	-	-	-	1	-	-
C311.4	3	-	-	-	-	-	-	-	-	-	-	-	1	-	-
C311.5	3	2	1	2	-	-	-	-	-	-	-	-	2	-	-
C311	**3**	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**

Content beyond syllabus added	POs strengthened/Vacant filled	CO/Unit
"Variable Frequency Drives-Power electronic simulation software based", designed specifically for use in power electronics and motor drive simulations.	PO5(2),PO7(2),PSO2(1)vacant filled	C311.5/V

STAFF INCHARGE **HOD/EEE**

K.L.N. College of Engineering, Pottapalayam- 630 612

Department of Electrical and Electronics Engineering

Lecture Schedule

Course/Branch: B.E/EEE **Subject :** Embedded Systems
Duration : January 2016 to April 2016 **Subject Code :** EE 6602
Semester : VI **Section:** A , B & C **Régulation :** 2013
AUC/AUT/AUM: AU-Chennai **Staff Handling : S.MANOHARAN , T.GOPU** & **R.JEYAROHINI**

OBJECTIVES

- To introduce the Building Blocks of Embedded System
- To Educate in Various Embedded Development Strategies
- To Introduce Bus Communication in processors, Input/output interfacing.
- To impart knowledge in Various processor scheduling algorithms.
- To introduce Basics of Real time operating system and example tutorials to discuss on one real time operating system tool

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

CO	Course Outcomes	POs
C312.1	Analyze the basic build process of embedded systems, structural units in embedded processor and selection of processor and memory devices depending upon the applications.	1,2,4,5
C312.2	Classify the types of I/O device ports and buses and different interfaces for data transfer.	1,2,3,5
C312.3	Modeling of the Embedded Product Development Life Cycle (EDLC) by using different techniques like state machine model, sequential program model and concurrent model	1,2,3,4,5,6
C312.4	Analyze about the basic concept of Real Time Operating Systems and plan to scheduling of different task and compare the features of different types of Real Time Operating Systems	1,2,3,5,6
C312.5	Apply the knowledge of programming concepts of Embedded Systems for various applications like Washing Machine automotive and Smart Card System applications	1,2,3,5,6,7

S.No	*Date*	*Period No.*	Topics to be covered	Book No [Page No]
Unit-I			**INTRODUCTION TO EMBEDDED SYSTEMS**	**Target Period:9**
1.			Introduction to Embedded Systems	T1[1-7]
2.			The build process for embedded systems	Material
3.			Structural units in Embedded processor	T1[8]
4.			Selection of processor & memory devices	T1[113-118]
5.			DMA	T[218]
6.			Memory management methods	Material
7.			Timer and Counting devices	T1[152]
8.			Watchdog Timer, Real Time Clock	T1[157-158]
9.			In circuit emulator, Target Hardware Debugging	T1[656]
				Total Periods : 9
Unit-II			**EMBEDDED NETWORKING**	**Target Period:9**
10			Embedded Networking: Introduction	Material
11			I/O Device	T1[130-131]
12			Ports & Buses	T1[131-136]
13			Serial Bus communication protocols -RS232 standard	T1[137]

14			RS422 – RS485	Material,T1[138]
15			CAN Bus	T1[161-163]
16			Serial Peripheral Interface (SPI)	T1[139-140]
17			Inter Integrated Circuits (I^2C)	T1[161]
18			Need for device drivers	T1[188]
Assignment 1				**Date of Submission :**
Test-II-CIT-I-[ ]				**Total Periods : 9**
Unit-III			**EMBEDDED FIRMWARE DEVELOPMENT ENVIRONMENT**	**Target Period:9**
19			Embedded Product Development Life Cycle- objectives	R1[622-625]
20			Different phases of EDLC	R1[625-636]
21			Modeling of EDLC	R1[636-641]
22			Issues in Hardware-software Co-design	R1[205-206]
23			Data Flow Graph	R1[207-208]
24			State machine model	R1[208-211]
25			Sequential Program Model	R1[211]
26			Concurrent Model	R1[212-213]
27			Object oriented Model	R1[213-214]
Assignment - 2			**Date of Submission :**	**Total Periods : 9**
Unit-IV			**RTOS BASED EMBEDDED SYSTEM DESIGN**	**Target Period:9**
28			Introduction to basic concepts of RTOS	T1[351-354]
29			Task, process & threads, Multiprocessing and Multitasking	T1 [305-308]
30			Interrupt routines in RTOS	T1 [366-370]
31			Preemptive and non-preemptive scheduling	T1 [392-397]
32			Task communication shared memory, message passing	T1 [326-330,335]
33			Inter process Communication – synchronization between processes	T1 [330-332]
34			Semaphores, Mailbox, pipes	T1 [334-341]
35			Priority inversion, priority inheritance	T1 [329-330]
36			Comparison of Real time Operating systems: Vx Works, чC/OS-II, RT Linux	T1 [453,496]
Assignment - 3				**Date of Submission :**
Test – III – Class Test – II [ ]				**Total Periods :9**
Unit-V			**EMBEDDED SYSTEM APPLICATION DEVELOPMENT**	**Target Period:9**
37			Introduction to washing machine and block diagram	R1[83-85]
38			Design specification & schematic diagram	R1[83-85]
39			Software design of washing machine	R1[83-85]
40			Introduction to Automotive application	R1[85-89]
41			Classification of automotive embedded systems	R1[85-89]
42			Advance control of automotive system & car navigation systems	R1[85-89]
43			Introduction to smart card systems & block diagram	T1[593-604]
44			ASIC for smart card systems	T1[593-604]
45			Embedded software for smart card systems	T1[593-604]
46			Proteus Simulation tool for Embedded Systems[Content Beyond Syllabus]	Material
Test – IV – CIT – II – [ ]				**Total Periods :9**
Test – V – Model Examination – Theory [ ]				

Book Reference

S.No	Title of the Book	Author	Publisher	Year
T1	Embedded System-Architecture, Programming, Design	Rajkamal	Mc Graw Hill	2013
T2	Embedded system Design	Peckol	John Wiley & Sons	2010
T3	Embedded Systems-An Integrated Approach	Lyla B Das	Pearson	2013

R1	Introduction to Embedded Systems	Shibu. K.V	Tata Mcgraw Hill	2009
R2	Making Embedded Systems	Elicia White	O' Reilly Series SPD	2011
R3	Embedded Systems Architecture	Tammy Noergaard,	Elsevier	2006
R4	Embedded system Design Using C8051	Han-Way Huang,	Cengage Learning	2009
R5	Real-Time systems Theory and Practice	Rajib Mall	Pearson Education	2007

Website reference:

http://nptel.ac.in/courses/108105057/
http://nptel.ac.in/courses/108102045/
https://docs.google.com/file/d/0B7tBh7YQV0DGTHVMa0ZRVzh0XzQ/edit

STAFF INCHARGE **HOD/EEE**

K.L.N. COLLEGE OF ENGINEERING
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
Lecture Schedule

Courses/Branch : BE / EEE Subject : Power System Operation and Control
Duration : July – Oct'2014 Subject Code : EE6603
Semester : VI Section: A, B &C Staff Handling : Dr.K.Gnanambal, C.Muthamil Selvi & J.Merlin
Regulation : 2013 AUC

AIM

To understand the day to day operation of power system and the control actions to be implemented on the system to meet the minute-to-minute variation of system load demand.

OBJECTIVES

1. To have an overview of power system operation and control.
2. To model power-frequency dynamics and to design power-frequency controller.
3. To model reactive power-voltage interaction and the control actions to be implemented for maintaining the voltage profile against varying system load.

PREREQUISITES: Transmission and Distribution, Power system analysis

CO	Course Outcome	POs	PSOs
C313.1	Analyze the various load characteristics with load curve and load duration curve.	1,2,5	1
C313.2	Describe modeling of power-frequency dynamics and design power-frequency controller	1,2,3,4,5	1
C313.3	Explain the modeling of reactive power-voltage interaction and the control actions	1,2,3,4,5	1
C313.4	Solve economic dispatch problems and unit commitments problems in power systems	1,2,3,4,5	1
C313.5	Explain the need of computer controls to energy management using SCADA	1,2,5	1

UNIT I- INTRODUCTION				Target Period:10
S.No	Date	Period Number	Topics to be Covered	Book No [Page No]
1			System load – variation	T3 [1.4-1.5]
2			System - load characteristics	T3 [1.5-1.15]
3			System - load curves and load-duration curve (daily, weekly and annual)	T3 [1.16-1.17]
4			load factor - diversity factor	T3 [1.18-1.27]
5			Importance of load forecasting and simple techniques of forecasting.	T3 [1.36-1.37] R1[575- 577]
6			An overview of power system operation	T3 [1.36-1.38]
7			An overview of power system control The role of computers in the implementation. (Qualitative treatment with block diagram).	T3 [1.33-1.36]
8			Class Test-1	
UNIT II REAL POWER - FREQUENCY CONTROL				**Target Period:9**
9			Basics of speed governing mechanism and modeling	T3 [2.2-2.12]
10			speed load characteristics – load sharing between two synchronous machines in parallel.	T3 [2.12-2.27]
11			Control area concept LFC control of a single-area system. Static Controlled and	T3 [2.27-2.41]

			uncontrolled	
12			Dynamic analysis of uncontrolled and controlled cases.	T3 [2.41-2.55]
13			Integration of economic dispatch control with LFC.	T3 [2.55-2.57]
14			Two area system modeling- static analysis of controlled case	T2[727-732]
15			Tie line with frequency bias control of two-area system	T3[2.71-2.75]
16			state variable model	T3[2.75-2.77]
CIT –I Date:08.08.14 **Assignment -1** **Date of Announcement: 12.7.14** **Date of Submission:25.7.14**				
UNIT III REACTIVE POWER–VOLTAGE CONTROL				**Target Period:10**
17			Basics of reactive power control – Types of Excitation systems	T3[3.1-3.4]
18			Excitation systems – modeling	T3[3.4-3.9]
19			Static and dynamic analysis	T3[3.9-3.12]
20			Stability compensation	T3[3.15-3.17]
21			Generation and absorption of reactive power	T3[4.6-4.17]
22			Relation between voltage, power and reactive power at a node	R7[3.15 – 3.17]
23				
24			Method of voltage control	T3[4.19-4.30]
25			Tap changing transformer. System level control using generator voltage magnitude setting, tap setting of OLTC transformer and MVAR injection of switched capacitors to maintain acceptable voltage profile and to minimize transmission loss.	T3[4.34-4.4.39] T3[4.42-4.49]
26			Class Test-2	
UNIT IV COMMITMENT AND ECONOMIC DISPATCH				**Target Period:9**
27			Statement of economic dispatch problem	T3[6.1-6.3]
28			cost of generation , incremental cost curve	T3[6.3-6.11]
99			Coordination equations without loss and with loss	T3[6.11-6.15]
30			solution by direct method and λ- iteration method. (No derivation of loss coefficients).	T3[6.16-6.40]
31			Statement of Unit Commitment problem – constraints; spinning reserve, thermal unit constraints, hydro constraints, fuel constraints and other constraints.	T3[5.1-5.5]
32			Solution methods – Priority list methods (Numerical problems only in priority-list method using full-load average production Cost)	T3[5.5-5.13]
33			Forward dynamic programming approach.	T3[5.13-5.15]
CIT-II Date:22.9.14 **Assignment -II** **Date of Announcement:12.8.14** **Date of Submission:22.8.14**				
UNIT V COMPUTER CONTROL OF POWER SYSTEMS				**Target Period:10**
34			Need of computer control of power systems.	T3[7.1]

35			Concept of energy control centre (or) load dispatch centre and the functions -	T3[7.3-7.5]
36			system monitoring data acquisition and control.	T3[7.5-7.7]
37			System hardware configuration – SCADA EMS functions.	T3[7.7-7.14] T3[7.1-7.3]
38			Network topology	T3[7.2-7.28]
39			state estimation	T3[7.28-7.45]
40			Security analysis and control. Various operating states (Normal, alert, emergency, in-extremis and restorative). State transition diagram showing various state transitions and control strategies	T3[7.45-7.50]
41			Content Beyond the Syllabus: Solution of Economic Dispatch problem using Optimization Techniques	Notes
CIT –III			Date: 13.10.14 (Model Test)	

Text Book

S.No	Title of the Book	Author	Publisher	Year
1	Power System Stability and Control	P.Kundur	Tata McGraw Hill Publishing company, New Delhi	2007
2	Power System Analysis Operation and Control	Abhijit Chakrabarti, Sunita Halder	2nd Edition,Prentice Hall of India	2008
3	Power System Operation and Control	M.Jeraldin Ahela	A.R.S. Publiations Chennai	2011

Reference Book

1.	Electric Energy System Thory:An Introduction	Elgerd, O.I	Tata McGraw Hill Edition	1983
2.	Power System Analysis	Hadi Saadat	Tata McGraw Hill Publishing company, New Delhi	2002
3.	Generation,Distribution And Utilization opf Electrical Energy	C.L.Wadhwa	New Age International Pvt.Ltd	2003
4.	Power Generation Operation and Control	Allen J.Wood, Bruce F.Wollenberg	John Wily and Sons, Inc	2003
5.	Modern Power Sytem Analysis Third Edition	I.J.Nagrath and D.P.Kothari	Tata McGraw Hill Publishing company, New Delhi	2003
6.	Power System Operation and Control	V.Ramanathan, P.S.Manoharan	Charulatha Publications	2008
7.	Power System Operation and Control	S. Ramar P.Selvam	Scitech Publications	2012

Staff In charge **HOD / EEE**

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

Lecture Schedule

Degree/Programme: **B.E / EEE**

Course code &Name: **EE 6604** DESIGN **OF ELECTRICAL MACHINES** Duration: **Jan -Apr 2016**

Semester: **VI** Section: **A,B,C.** Staff : **Dr.S.M.KANNAN** Regulation : **2013/AUC**

AIM: To expose the students to the concept of design of various types of Electrical Machines.

OBJECTIVES

- To study mmf calculation and thermal rating of various types of electrical machines.
- To design armature and field systems for D.C. machines.
- To design core, yoke, windings and cooling systems of transformers.
- To design stator and rotor of induction machines.
- To design stator and rotor of synchronous machines and study their thermal behavior.

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

CO	Course Outcomes	POs	PSOs
C314.1	Compare Electrical Engineering materials, determine heat dissipation due Conduction, convection and radiation**.**	1,2,3,5	**2,1**
C314.2	Calculate mmf for slots and teeths, apparent flux density, main dimensions and winding details of DC machines.	1,2,3,5	**2,1**
C314.3	Design core, yoke , winding and cooling system of transformers.	1,2,3,5	**2,1**
C314.4	Develop output equation of AC machines, design stator and rotor of induction machines.	1,2,3,5	**2,1**
C314.5	Design stator and rotor of synchronous machines analyze their thermal behavior, design field systems for turbo alternators.	1,2,3,5	**2,1**

S.No	Date	Period Number	Topics to be Covered	Book No [Page No]
			UNIT I: INTRODUCTION	**Target Periods : 9+3**
1			Design of machines-major considerations-design factors-limitations in design.	1(1.1-1.4) 2(20-21)
2			Electrical engineering materials- Electrical Conducting materials-requirements — characteristics-copper& aluminium-iron and steel-alloys of copper-materials of high resistivity	1(2.1-2.10) 3(11-15)
3			Magnetic materials-soft & hard-hysteresis loop-ageing-dynamo grade steel-transformer grade steel-high resistance steel-c.r.o.s-	1(2.10-16) 3(15-36)
4			Insulating materials-electrical properties-classification of Insulating materials-application of insulating materials	1(2.16-2.24)
5			Total loadings-specific electric and magnetic loadings-choice of specific magnetic &electric loadings	1(6.1-6.14) 2(17-18)
6			Rating of machines-standard specifications	1(4.29),2(5-6)
7			Thermal considerations-modes of heat dissipation-conduction-radiation-convection-calculation of internal temperature-temperature gradient in cores-Tutorial-I-	1(4.1-4.11)
8			Heat flow in two dimensions	1(4.11-4.13)
9			Thermal resistivity of winding-space factor-Tutorial-II-	1(4.13-4.14)
10			Thermal state in Electrical machines-heating &cooling time constant-temperature rise-Tutorial-III-	1(4.18-4.29)
Total Periods:		**12**	***Assignment-I-DOS:*** ***Test-I :***	
			UNIT II:DC MACHINES	**Target Periods : 10+3**

11			Magnetic circuit Calculations-Calculation of mmf-airgap-smooth and slotted armature-fringing-Carter's gap coefficient-	1(3.1-3.17) 2(49-64) 3(101-1123)
12			Gap contraction factor for slots and ducts-effect of saliency-field form factor-net length of Iron-mmf for teeth-	1(3.1-3.17)
13			Real and apparent flux densities	1(3.17-27)
14			Tutorial - I	
15			Constructional details-relation between rating and dimensions of rotating machines-Main dimensions-Output equation of D.C. machines-output co-efficient.	1(6.1-6.4) 2(110-112) 3(451-452)
16			Selection of Number of Poles-guiding factor for choice of number of poles-core length-pole proportions-pole face profile- Separation of D and L for D.C. Machines-	1(9.18-25) 2(114) 3(456-461)
17			Tutorial - II	
18			Factors affecting size of Electric Machines- Choice of specific Magnetic Loading-Choice of Specific electric loadings-	1(6.4-6.18) 2(16,113-114)
19			Armature design-Choice of armature winding-No.of armature conductors-armature coils-guiding factors for choice of No.of armature slots-slot dimensions-	1(9.40-58) 2(116-119) 3(461-466)
20			Tutorial - III	
21			Design of Commutator No.of segments-Commutator diameter-	1(9.88-95) 2(151-153) 3(471-473)
22			Design of brushes-dimensions of brushes-	1(9.88-95) 2(151-153) 3(471-473)
23			Variation of output and losses with linear dimensions-	1(6.4-6.18)
Total Periods:		**13**	***Assignment –II-DOS:*** ***CIT-I-***	
			UNIT-III-TRANSFORMERS **Target Periods : 9+3=12**	
24			Constructional details-emf equation-core/Shell type-single/ three phase-distribution/power transformer—tappings and tap changing-bushings-transformer oil-conservator and breather-Bucholz relay	1(5.1-5.47) 2(215-216) 3(192-210)
25			Design-output equation-single phase-three phase-volt per turn-optimum designs-variation of output and losses of transformer with linear dimensions	1(5.49-54) 2(217-222) 3(210-215)
26			Design of core-rectangular –square core-stepped core-core area-window space factor-window dimensions-Overall dimensions-Amorphous cores-	1(5.54-84) 2(222-227) 3(215-231)
27			Tutorial - I	
28			Design of shell type Transformer-Problems	1(5.73) 2(227-241) 3(253-260)
29			Operating characteristics-Leakage reactance of transformer	1(5.85-88)
30 31			Regulation of transformer-No load current-magnetizing Volt-ampere-	1(5.90-5.92) 1(5.98-102)
32			Tutorial - II	
33			Temperature rise of transformer-Design of tank with tubes-cooling of transformer	1(5.104-109)
34			Tutorial - III	

Total Periods:		**12**	***Assignment-III-[DOS:***	***-Test-3:***
			UNIT-IV- INDUCTION MOTORS	**Target Periods : 9+3=12**
35			Three phase induction motors-review-comparison of SR & SC Induction motor-Output equation-choice of average flux density and ampere conductors-efficiency and p.f.-Main dimensions-turns per phase-Number of stator slots-area of stator slots-lmt	1(10.1-19) 2(273-280) 3(291-313)
36			efficiency and p.f.-Main dimensions-turns per phase-Number of stator slots-area of stator slots-lmt	
37			Rotor design-length of air gap-relations for calculation of length of airgap	1(10.19-21) 2(281-283) 3(313-320)
38			Tutorial - I	
39			Design of squirrel cage rotor-number of slots-crawling-cogging-rule for selecting rotor slots-problems	1(10.21-28) 2(283)1
40			Design of rotor bars and slots-rotor bar current-area of rotor bars-shape and size of rotor slots-design of end rings-end ring current-area of end ring-problems.	1(10.28-34) 2(284-286) 3(322-330)
41			Design of wound rotors-number of rotor slots-number of rotor turns-area of rotor conductors-problems.	1(10.34-41) 2(287-289) 3(336-339)
42			Tutorial - II	
43			Operating characteristics-No load current-problems-short circuit current-stator resistance-rotor resistance-problem-	1(10.41-61) 2(289)
44			dispersion co-efficient and its effects-Short Circuit Ratio-D and L for best power factor-problems.	1(10.41-61) 2(289)
45			Tutorial-III-	
46			Magnetic leakage calculations-specific permeance-leakage reactance-various leakage fluxes-UMP	1(3.36-42) 3.72
47	Seminar-I		Leakage reactance calculation for induction &synchronous machines-/Semianr-I	1(3.42-45)
Total Periods:		**12**	***CIT-II :***	
			UNIT V: SYNCHRONOUS MACHINES	**Target Periods : 9+3=12**
48			Type of construction-revolving field-advantages-salient pole, cylindrical rotor-types of synchronous machines-	1(11.1-15) 2(290-293) 3(399-407)
49			prime movers for synchronous generators-run away speed-damper winding-Construction of Turbo alternators	
50			Design-output equation-choice of specific magnetic, electric loading-design of salient pole machines-main dimensions-	1(11.15-18)
51			Tutorial-I-	
52			Short circuit ratio-effect of SCR on machine performance-length of air gap-shape of pole face-Number of armature slots-coil span-turns per phase-conductor section	1(11.18-26) 2(293-295) 3(408-411)
53			shape of pole face-Number of armature slots-coil span-turns per phase-conductor section	
54			Slot dimensions-length of mean turn-elimination of harmonics-problem.	1(11.26-41)
55			Design of damper winding-problem-height of pole-determination of full load field mmf-design of field winding-	1(11.41-51) 3(426-435)
56			Estimation of Airgap length	1(11.35-37)
57			Design of turbo alternators-main dimensions-length of air gap-problem-rotor design.	1(11.56-60) 2(297-298) 3(436-442)
58			Tutorial - II,III	

59			Beyond subject content: Computer aided design-analysis method-synthesis method-program to design main dimensions of Alternator.	1(22.1-7) 3(553-584)
60			Seminar-II/Quiz	
Total Periods:		**12**	***CIT-III :***	

Books: Text/Reference:

S. No		Title of the Book	Author	Publisher	Year
1	**T1 (1)**	"A Course in Electrical Machine Design"	Sawhney A.K.	Dhanpat Rai & Sons, New Delhi, 1984.	2010
2	**T2**	"Principles of Electrical Machine Designs with Computer Programmes"	Sen, S.K.	Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi	1987
3	**R1**	"Electrical Machine Design Data Book"	Shanmuga sundaram.A, Gangadharan.G, Palani.R	New Age Intenational Pvt. Ltd.	2007
4	**R2**	"Electrical Machine Design"	Balbir Singh,	Brite Publications,Pune	-
5	**R3 (2)**	A Simplified text in Electrical Machine Design	A.Nagoor Kani	RBA,Chennai,	2010
6	**R4 (3)**	Principles of Electrical Machine Design	A.K.Agarwal	Kataria&Sons,	2010

STAFF INCHARGE **HOD/EEE**

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

Lecture Schedule

Degree/ Program	:	**B.E/ Electrical and Electronics Engineering**	Course code & Name	:	**EE6002- POWER SYSTEM TRANSIENTS (C315E3)**
Duration	:	**Jan - Apr 2016**	Semester	:	**VI** ; Section : **A**, **B, C**
Regulation	:	**2013/AUC**	Staff handling	:	**A.MARIMUTHU C.MUTHAMIL SELVI**

AIM

To review the over voltages (or) surges due to the phenomena of switching operations and lighting discharge. Also to study propagation, reflection and refraction of these surges on the equipments their impact on the power system grid

OBJECTIVE

1. To understand the importance of the study of transients.
2. To study the generation of switching transients and their control using circuit – theoretical concept.
3. To study the mechanism of lighting strokes and the production of lighting surges.
4. To study the propagation, reflection and refraction of travelling waves.
5. To study the impact of voltage transients caused by faults, circuit breaker action, load rejection on integrated power system.

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

Course	Course Outcomes	POs	PSOs
C315E3.1	Explain the concept of transients and Compute the solution of transient current equation for RL and RLC system.	1,2	2
C315E3.2	Illustrate the importance of switching transients, Explain the concept of resistance switching, load switching and capacitance switching.	1,2,7	2,1
C315E3.3	Explain the concept of lightning mechanism, Describe the interaction between lightning and power system	1,2,6,7,8	1,1
C315E3.4	Apply the concept of reflection and refraction, Draw the Bewley Lattice diagram for different systems.	1,2,5	1,1
C315E3.5	Explain the concept of transients and Compute the solution of transient current equation for RL and RLC system.	1,2,5	1,1

S.No	Date	Period No	Topics to be Covered	Book No [Page No]
UNIT I - INTRODUCTION AND SURVEY				**Target periods : 09**
1			Review and importance of the study of transients	R2[1.1]
2			Causes for transients.	R2[1.1-1.8]
3			RL circuit transient with sine wave excitation	R2[2.1-2.4]
4			Double frequency transients	R2[2.4-2.8]
5			Basic transforms of the RLC circuit transients	R2[2.4-2.13]
6			Different types of power system transients	R2[1.8-1.11]
7			Effect of transients on power systems	R2[1.11]
8			Role of the study of transients in system planning	R2[1.11-1.12]
Total periods:		9	***Assignment-I-DOS:*** ***Test-I :***	
UNIT II - SWITCHING TRANSIENTS				**Target periods: 09**
9			Over voltages due to switching transients	R2[3.1-3.3]
10			Resistance switching and the equivalent circuit for interrupting the resistor current	R2[2.13-2.18]
11			Load switching and equivalent circuit, waveforms for transient voltage across the load and the switch	R2[2.18-2.22]
12			Normal and abnormal switching transients	R2[2.22]
13			Current suppression, current chopping effective equivalent circuit.	R2[2.22-2.25]
14			Capacitance switching ,effect of source regulation	R2[2.25-2.27]

15			Capacitance switching with a restrike, with multiple restrikes.	R2[2.27-2.29]
16			Illustration for multiple restriking transients ferro resonance	R2[2.29-2.33
Total Periods:		**9**	***Assignment –II-DOS:*** ***CIT-I-***	
Assignment 1 Date of Submission :				
UNIT III - LIGHTNING TRANSIENTS				**Target periods :09**
17			Review of the theories in the formation of clouds and charge formation	R2[3.3-3.6]
18			Rate of charging of thunder clouds	R2[3.6-3.8]
19			Mechanism of lightning discharges	R2[3.8-3.12]
20			Characteristics of lightning strokes, factors contributing to good line design	R2[3.13-3.16]
21			Protection using ground wires	R2[3.16-3.20]
22			Tower footing resistance	R2[3.20-3.24]
23			Interaction between lightning and power system	R2[3.24-3.27]
24			Model for lightning stroke	R2[3.27-3.29]
Total Periods:		**9**	***Assignment-III-[DOS:*** ***-Test-3:***	
UNIT IV - TRAVELING WAVES ON TRANSMISSION LINE COMPUTATION OF TRANSIENTS Target periods:09				
25			Computation of transients ,transient response of systems with series and shunt distributed lines	R2[4.1-4.10]
26			Transient response of systems with series and shunt lumped parameters and distributed lines	R2[4.10-4.15
27			Traveling wave concept, step response,	R2[4.15-4.24
28			Reflection and refraction of travelling waves	R2[4.24-4.37]
29			Bewely's lattice diagram	R2[4.37-4.42]
30			Standing waves and natural frequencies	R2[4.42-4.56]
	Seminar-I		Simulation of transient response of systems with series and shunt lumped parameters and distributed lines using MATLAB	
Total Periods:		**10**	***CIT-II :***	
UNIT V - TRANSIENTS IN INTEGRATED POWER SYSTEM				**Target periods :09**
31			The short line and kilometric fault, distribution of voltages in a power system	R2[5.1-5.7]
32			Line dropping and load rejection	R2[5.7-5.8]
33			Voltage transients on closing and reclosing lines	R2[5.8-5.9]
34			Over voltage induced by faults	R2[5.9-5.10]
35			Switching surges on integrated system.	R2[5.10-5.16
36			Qualitative application of EMTP for transient computation	R2[5.16-5.22
37			*Content Beyond the Syllabus:* Transient analysis using PSCAD	
38	Seminar-II		Computation of transients using MATLAB	
39			Quiz-I	
40			Quiz-II	
Total Periods:		**13**	***CIT-III :***	

TEXT BOOKS

	Title of the Book	**Author**	**Publisher**	**Year**
T1	Electrical Transients in Power Systems	Allan Greenwood,	Wiley Interscience, New York, 2nd edition	1991.
T2	Extra High Voltage AC Transmission Engineering	Begamudre.R.D,	Wiley Eastern Limited,	1986.
R1	High Voltage Engineering	Naidu.M.S and Kamaraju.V,	Tata McGraw Hill, 2nd edition	
R2	Power System Transients	Sivasangari. R, Nagalakshmi.S, Rampriya.S	Anuradha Publications	2011

STAFF INCHARGE **HOD/EEE**

K.L.N. COLLEGE OF ENGINEERING

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

EC6651 - COMMUNICATION ENGINEERING [C310]

Important Questions/Assignments/Self study /Seminar topics.

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

CO	Course Outcomes	POs	PSOs
C310.1	Explain the operation of Amplitude Modulation , draw the frequency spectrum and vector representation of AM	1,2,3,4,5,7,11	1,2,3
C310.2	Compare the different methods of QPSK, BFSK and GMSK	1,2,3,4,5,6	1,3
C310.3	Analyze how information is transmitted to receiver using the Huffman coding	1,2,3,6,7	1,3
C310.4	Discuss about the various types of multiple access techniques	1,3,4,5,	1,2
C310.5	Distinguish between INTELSAT and INSAT	1,2,3,5,11	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
C310.1	2	3	1	2	3	-	1	-	-	-	2	-	2	1	1
C310.2	3	2	1	3	1	3	-	-	-	-	-	-	2	-	1
C310.3	3	3	1	-	-	2	3	-	-	-	-	-	2	-	1
C310.4	3	-	1	1	3	-	-	-	-	-	-	-	1	1	-
C310.5	3	1	1	-	3	-	-	-	-	-	**1**	-	1	1	-
C310	3	2	1	1	2	1	1	-	-	-	1	-	2	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.

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.

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.

S.No.	4. Important Questions.	COs	POs
Q.1.1.	Name the methods used for the suppression of unwanted side band in AM transmission?	C310.1	3

Q.1.2.	Compare the features of FM with AM and also writes its merits and demerits.	C310.1	1,3
Q.1.3.	Explain the operation of SSB transmitter and Receiver.	C310.1	1,2,3
Q.1.4.	How will you generate the FM signal using direct and indirect method?	C310.1	1,3
Q.1.5.	How will you generate the FM signal using Amstrong method?	C310.1	1,3
Q.2.1.	Discuss the process of companding and its characteristics.	C310.2	1
Q.2.2.	How does the Flat top sampling differs from the natural sampling? also discuss the filtered output.	C310.2	1,2
Q.2.3.	Explain the QPSK with block diagram and spectrum also discuss the phasor diagram of sinusoids	C310.2	1,3
Q.2.4.	Explain the operation of QPSK receiver and derive the expression for bit error.	C310.2	1,2,3
Q.2.5.	Explain the working of Delta modulation scheme.	C310.2	1,3
Q.3.1.	Derive the expression for Quantization noise in PCM & DM systems.	C310.3	1,2,3
Q.3.2.	Discuss the Badwidth Trade off of a communication systems.	C310.3	1,2
Q.3.3.	Apply the following coding techniques to obtain the output waveform of bit stream 10011100 by NRZ, RZ, AMI, HDBP, ABQ, MBnB.	C310.3	1,2,3
Q.3.4.	Design a convolution coder of constraint length 6 and rate efficiency ½.	C310.3	1,2,3
Q.3.5.	State and prove Shanon noiseless coding theorem.	C310.3	1,2,3,4
Q.3.6.	Discuss the viter bi algorithm by showing the possible paths through the trellis of a coder. Assume the state diagram of any coder.	C310.3	1,2
Q.4.1.	500 users employ FDMA to transmit 1000-bit packets of data. The channel bandwidth is 100MHZ and QPSK is used at each of the 500 carrier frequencies employed. What is the maximum bandwidth allocated to each user. What is the bit rate employed by each user? How long does it take to transmit a packet?	C310.4	1,2
Q.4.2.	Explain TDMA and FDMA systems.	C310.4	1,3
Q.4.3.	Compare wire and wireless communication systems.	C310.4	1
Q.4.4.	Draw a typical TDMA system and explain the operation with its time pattern.	C310.4	1,3
Q.5.1.	Discuss broadly on the multiple access techniques used in satellite communications.	C310.5	1,3

S.No.	**4. Important Questions.**	COs	POs
Q.5.2.	Describe the following (i) Optical Detectors and their types. (ii) Satellite types (iii) Digital filters used in Satellite systems (iv) Optical Link	C310.5	1
Q.5.3.	An band transponder of a geo synchronous satellite at height of 35,760 km from the surface of earth and operating at 7.6 GHz has its antenna oriented towards earth station antenna. The input power and directive gain of the transponder antenna are 18 watts and 36dB respectively. Assuming no losses occurs in the down link determine (i) Power received by earth station antenna of aperture diameter and efficiency given as 3m and 62% respectively. (ii) EIRP of the transponder antenna.	C310.5	1,2,3
Q.5.4.	Write notes on SCADA and Intelsat.	C310.5	1
Q.5.5.	What are the modes of operation suggested in optical fibers and how are the classified according to this?	C310.5	1
	5.Assignments		
A.1.1.	An SSB transmission contains 10kW. This transmission is to be replaced by a standard AM signal with the same power content. Determine the power content of the carrier and each of the side bands when the percent modulation is 80**%. (Ans.**	C310.1	1,2

	P_C =7.58kW, **$P_{LSB} = P_{USB}$ = 1.21kW)**		
A.1.2	An AM transmitter radiates 10kW with carrier unmodulated and 11.5kW, when the carrier is modulated. Calculate the modulation factor if any sine wave, corresponding to 40% modulation, is transmitted simultaneously. Determine the total power. **(Ans. M_a=0.55, P_T = 12.3kW)**	C310.1	1,2
A.1.3	How would you compare the AM- DSB,AM-SSB, VSB, FM, PM based on their characteristics?	C310.1	1,2
A.1.4	Explain with block diagram the generation of analog signals using MATLAB.	C310.1	1,2,3, 4,5
A.2.1.	Apply the Shannon – Fanno coding procedure for the following message ensemble and also find the efficiency of the coding. **(Ans. Efficiency=96.03%)**	C310.3	1,2,3

Symbols	A	B	C	D	E	F
Probabilities	0.4	0.2	0.12	0.08	0.08	0.08

A.2.2.	Apply the Haffman coding procedure for the following message ensemble and also find the efficiency of the coding. **(Ans. Efficiency=97%)**					C310.3	1,2,3

Symbols	A	B	C	D	E
Probabilities	0.2	0.2	0.2	0.2	0.2

A.2.3.	Draw the various types of Line coding techniques for the data 1001110011.	C310.3	1,2
A.2.4.	How would you compare the various types of Line coding techniques based on their characteristics?	C310.3	1,2

S.No.	**5.Assignments**	COs	POs
A.3.1.	A digital satellite communication link is to be designed to transmit data at a 1MBps, with overall Eb/No of 14dB. If Eb/No of satellite downlink is 17dB, determine the EIRP required, assuming following parameters for uplink design. (i) uplink path loss = 214dB; (ii) total uplink path loss excluding path loss = 2.5dB; (iii) satellite receiver gain = 45dB; (iv) satellite receiver noise density = -169 dBM/Hz. Assuming uplink frequency of 30GHz, HPA power of 0.5W, determine the earth station antenna size, considering antenna efficiency of 60% also assume negligible losses between HPA to antenna input. **(Ans. EIRP = 49.5dB, the diameter of the earth station antenna =1.733m)**	C310.5	1,2,3
A.3.2.	Determine the optical power received in dBm and Watts for a 20km optical fiber link with the following parameter: (i) LED output power of 30mW; (ii) four 5km sections of optical cable each a loss of 0.5dB/km; (iii) Three cable to cable connectors with a loss of 2dB each; (iv) no cable splices; (v) light source to fiber interface loss of 1.9 dB; (vi) fiber to light defector loss of 2.1dB; (vii) no loss due to cable bends. **(Ans. Transmitted power Pt = 14.77dBm; Total loss = 20dB; Received optical power = 0.3mW)**	C310.5	1,2
	6. Seminar topics		
S.1.1.	**Global System for Mobile communication (GSM)**	C310.4	1,2,3,4,5,6,7
S.1.2.	**Near field communication (NFC)**	C310.4	1,2,3,4,5,6,7
S.2.1.	**Wireless Fidelity (Wi-Fi)**	C310.5	1,2,3,4,5,6,7
S.2.2.	**MATLAB applications to Communication systems**	C310.5	1,2,3,4,5

K.L.N. College of Engineering

Department of Electrical and Electronics Engineering

EE 6601 - SOLID STATE DRIVES [C311]

Important Questions/Assignments/Self study /Seminar topics.

1.Course outcomes

Course	Course outcomes	POs
C311.1	Classify the various types of drives and load torque characteristics and Apply the multi quadrant dynamics in hoist load system.	1
C311.2	Analyze the operation of steady state analysis of single phase and three phase fully controlled converter and Chopper fed separately excited dc motor drives and discuss the various control strategies of converter.	1,2,3,4
C311.3	Explain the operation and characteristics of various methods of solid state speed control of induction motor.	1,2
C311.4	Describe the operation of various modes of V/f control of synchronous motor drives and different types of permanent magnet synchronous motor drives.	1
C311.5	Design a current and speed controller and develop the transfer function for DC motor, load and converter, closed loop control with current and speed feedback.	1,2,3,4

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
C311.1	3	-	-	-	-	-	-	-	-	-	-	-	1	-	-
C311.2	3	2	1	3	-	-	-	-	-	-	-	-	3	-	-
C311.3	3	1	-	-	-	-	-	-	-	-	-	-	1	-	-
C311.4	3	-	-	-	-	-	-	-	-	-	-	-	1	-	-
C311.5	3	2	1	2	-	-	-	-	-	-	-	-	2	-	-
C311	**3**	**1**	**-**	**1**	**-**	-	-	-	-	-	-	-	**2**	-	-

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.

S.No.	**4. Important Questions.**	COs	POs
Q.1.1.	State the essential parts of electric drive and classify it. Explain its function	C311.1	1
Q.1.2.	Derive the mathematical condition for steady state stability of equilibrium point.	C311.1	1,2
Q.1.3.	Explain in detail the multi quadrant dynamics in the speed-torque plane.	C311.1	1,2
Q.1.4.	Explain the different modes of operation of an electrical drive.	C311.1	1
Q.1.5.	A motor having a suitable control circuit develops a torque given by the relation Tm= pω + q where p and q are positive constants. The motor is used to drive a load whose torque is expressed as TL = $r\omega^2$ + s where r and s are positive constants. The total inertia of the rotating masses is J. i) Determine the relation among p, q, r and s in order that the motor can start together with the load and have an equilibrium operating speed. ii) Calculate the equilibrium operating speed.	C311.1	1,2,3
Q.1.6.	Derive the expressions to find the equivalent load torque and equivalent inertia of loads in Translational and Rotational motion.	C311.1	1
Q.1.7.	Draw and describe the load torque characteristics of various drives.	C311.1	1
Q.2.1.	Describe in detail about the braking of DC and AC drives.	C311.2	1
Q2.2.	Explain in detail the operation and steady state analysis of single phase fully controlled converter fed dc drive with neat waveforms in continuous and discontinuous modes.	C311.2	1,2
Q.2.3.	Explain the discontinuous modes of operation fully controlled converter fed separately excited dc motor in detail with necessary waveforms and equations.	C311.2	1,2
Q2.4.	A 250V separately excited dc motor has an armature resistance of 2.5Ω when driving a load at 600 r.p.m. with constant torque, the armature takes 20 A. This motor is controlled by a chopper circuit with a frequency of 400 Hz and an input voltage of 250 V. (i) What should be the value of the duty ratio if one desires to reduce the speed from 600 to 540 r.p.m. with the load torque maintained constant. (ii) Find out the value of duty ratio for which the per unit ripple current will be maximum	C311.2	1,2
Q.2.5.	A 200 V, 875 rpm, 150 A separately excited dc motor has an armature resistance of 0.06 Ω. It is fed from a single phase fully controlled rectifier with an ac source of 220 V, 50 Hz. Assuming continuous conduction, calculate the firing angle for rated motor torque and 750 rpm.	C311.2	1,2
Q.2.6.	Explain with the circuit diagrams and waveform the operation of a three phase fully controlled converter fed separately excited dc motor	C311.2	1,2
Q.3.1.	Explain the stator voltage control of induction motor.	C311.3	1
Q.3.2.	Explain in detail with suitable diagrams and waveforms the v/f control applied to induction motor drives	C311.3	1,2
Q.3.3.	Explain with a neat diagram the field weakening mode control of induction motor drives	C311.3	1
Q.3.4.	Explain the closed loop control of CSI fed induction motor drives	C311.3	1,2
Q.3.5.	Describe with a neat diagram the working of a current fed inverter for an induction motor	C311.3	1,2
Q.3.6.	Draw and explain the speed torque characteristics of induction motor.	C311.3	1
Q.4.1.	Explain the open loop v/f control of synchronous motor in detail	C311.4	1,2
Q.4.2.	Write short notes on permanent magnet synchronous motor	C311.4	1,2,3
Q.4.3.	Explain the self controlled mode of operation of synchronous motor	C311.4	1,2
Q.4.4.	Explain power factor control of synchronous motor with relevant vector diagram	C311.4	1
Q.4.5.	Describe the constant margin angle control and power factor control of synchronous motor drives.	C311.4	1
Q.4.6.	A 3 phase, 400V, 50Hz,6 pole star connected round rotor synchronous motor has Zs=0+j2Ω Load torque proportional to speed squared is 340Nm at rated synchronous speed. The speed of the motor is lowered by keeping v/f constant and maintaining unity pf by field control of the motor. For the motor operation at 600rpm, calculate a) supply voltage)armature current c) excitation angle d) load angle e) pull out torque. Neglect rotational losses.	C311.4	1,2
Q.5.1.	Derive the closed loop transfer function of converter fed separately excited DC motor.	C311.5	1,2
Q.5.2.	Derive the transfer function of armature controlled DC motor	C311.5	1,2,3

Q.5.3.	Explain the closed loop operation of armature voltage control method with field weakening mode control in detail	C311.5	1,2,3
Q.5.4.	Explain the design procedure of current controller in detail	C311.5	1,2
Q.5.5.	Describe the design of speed controller with necessary diagrams	C311.5	1,2
Q.5.6.	Describe the various closed loop configurations applied in electrical drives	C311.5	1,2
Q.5.7.	Design the following controllers i)Current controller ii)Speed controller	C311.	1,2,3
Q.5.8.	Explain in detail about converter selection and characteristics	C311.5	1
Q.5.9.	A 50 KW, 240V,1700 rpm separately excited DC motor is controlled by a converter. The field current is maintained at If=1.4A and the machine back EMF constant is Kv=.91 VA rad/sec. The armature resistance is Rm=0.1Ω and the viscous friction constant is B=0.3Nm/rad/sec. The amplification of the speed sensor is K1=95 mV/rad/sec and the gain of the power controller is K2=100 i)Determine the reference voltage Vr to drive the motor at the rated speed ii)If the reference voltage is kept unchanged, determine the speed at which the motor develops rated torque.	C311.5	1,2,3
	5. Assignments/Seminar/Self study topics.		
A.1.1.	A drive has following equations for motor and load torques: $T = (1 + 2\omega_m)$ and $T_l = 3\sqrt{\omega_m}$ Obtain the equilibrium points and determine their steady-state stability	C311.1	1
A.1.2.	Obtain the equilibrium points and determine their steady-state stability when motor and load Torques is: $T = -1 - 2\omega_m$ and $T_l = -3\sqrt{\omega_m}$	C311.1	1
A.1.3.	Compare electrical and mechanical braking	C311.1	1
A.1.4.	Explain the methods of plugging and rheostatic braking as applied to dc motors and induction motors	C311.1	1
A.1.5.	Explain how an induction motor is brought to stop by (1) plugging and (2) dynamic braking	C311.1	1,2
A.2.1.	A 220V, 1500 rpm, 10A separately excited dc motor is fed from a single-phase fully-controlled rectifier with an ac source voltage of 230V, 50Hz. R_a=2Ω. Conduction can be assumed to be continuous. Calculate firing angles for, (a.)Half the rated motor torque and 500rom. (b) Rated motor torque and (-1000) rpm.	C311.2	1,2,3
A.2.2.	A 220V, 1200rpm, 15A separately excited motor has armature resistance and inductance of 1.8Ω 32mH respectively. This motor is controlled by a single-phase fully- controlled rectifier with an ac source voltage 0f 230V, 50Hz. Identify the modes and calculate developed torques For: (a) $\alpha=60^o$ and speed = 450 rpm (b) $\alpha=60^o$ and speed = 1500 rpm	C311.2	1,2,3,4
A.2.3.	A 220V, 750 rpm, 200A separately excited motor has an armature resistance of 0.05 Ω. armature is fed from a three-phase non-circulating current dual converter consisting of fully- controlled rectifiers A and B. Rectifier A provides motoring operation in the forward direction and rectifier B in reverse direction. Line voltage of ac source is 400V. Calculate firing angles of rectifiers for the following assuming continuous conduction. (a) Motoring operation at rated torque and 600 rpm. (b)Regenerative braking operation at rated torque and 600 rpm	C311.2	1,2,3,4
A.2.4.	A 220V, 24A, 100 rpm, separately excited dc motor has an armature resistance of 2Ω. Motor is controlled by a chopper with frequently of 500Hz and source voltage of 230V. Calculate the Duty ratio for 1.2 times rated torque and 500 rpm	C311.2	1,2,3
A.2.5.	A 230V separately excited dc motor takes 50A at a speed of 800 rpm. It has armature resistance of 0.4Ω. This motor is controlled by a chopper with an input voltage of 230V and frequency of 500Hz. Assuming continuous conduction throughout, calculate the plot speed-torque characteristics for:	C311.2	1,2,3,4

	(a)Motoring operation at duty ratios of 0.3 and 0.6. (b)Regenerative braking operation at duty ratios of 0.7 and 0.4		
A.3.1.	Describe the principle and operation of constant air gap flux control in detail	C311.3	1,2
A.3.2.	Draw and explain the various modes(variation of torque , power Limitations and high speed modes) of operation of induction motor	C311.3	1,2
A.3.3.	Describe in detail closed loop speed control of VSI drive and CSI drive	C311.3	1
A.3.4.	Compare VSI and CSI drives	C311.3	1
A.4.1.	Describe using a diagram the construction of a trapezoidal surface mounted permanent magnet synchronous motor, draw and explain the stator voltage & current waveform	C311.4	1
Sem.1.1.	Current status of AC and DC drives	C311.1	1
Sem.2.1.	Semiconductor converter controlled drives	C311.2	1
Sem.3.1.	Linear induction motors and its control	C311.3	1
Sem.4.1.	Poly-phase AC motors for traction drives	C311.4	1
Sem.5.1.	Closed loop speed control of multi motor drive	C311.5	1,2
Self.1.1.	PLL control of electric drives(one page-self study)	C311.1	1,2
Self.3.1.	Induction motor analysis and performance(one page-self study)	C311.3	1
Self.5.1.	Closed loop position control(one page-self study)	C311.5	1,2

K.L.N. College of Engineering

Department of Electrical and Electronics Engineering

EE6602-EMBEDDED SYSTEMS [C312]

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

1.Course outcomes

Course	Course outcomes	POs
C312.1	Analyze the basic build process of embedded systems, structural units in embedded processor and selection of processor and memory devices depending upon the applications.	1,2,4,5
C312.2	Classify the types of I/O device ports and buses and different interfaces for data transfer.	1,2,3,5
C312.3	Modeling of the Embedded Product Development Life Cycle (EDLC) by using different techniques like state machine model, sequential program model and concurrent model	1,2,3,4,5,6
C312.4	Analyze about the basic concept of Real Time Operating Systems and plan to scheduling of different task and compare the features of different types of Real Time Operating Systems	1,2,3,5,6
C312.5	Apply the knowledge of programming concepts of Embedded Systems for various applications like Washing Machine automotive and Smart Card System applications	1,2,3,5,6,7

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
C312.1	2	1	-	1	1	-	-	-	-	-	-	-	1	-	-
C312.2	2	1	-	2	1	-	-	-	-	-	-	-	1	-	-
C312.3	2	1	2	2	1	1	-	-	-	-	-	-	2	-	-
C312.4	2	1	1	-	1	1	-	-	-	--	-	-	1	-	-
C312.5	2	1	2	-	1	1	1	-	-	-	-	-	1	-	-
C312	2	1	1	1	1	-	-	-	-	-	-	-	1	-	-

s3.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.

S.No.	**4. Important Questions.**	COs	POs
Q.1.1.	List the Hardware units that must be present in the embedded systems	C312.1	1,3
Q.1.2.	Why do you need at least one timer device in an embedded systems	C312.1	2
Q.1.3.	Define timer .Analyze a counter following performance (a) timer function (b) prefixed time initiated events generation(c) Time capture function.	C312.1	2
Q.1.4.	Analyze the performance of DMA controller and explain the mode of data transfer.	C312.1	1,2
Q.1.5.	Why should a program be divided into functions and each placed in different memory blocks or segments?	C312.1	3
Q.1.6.	How to solve the critical problems used by watch dog timer with suitable example .	C312.1	2
Q.1.7.	How to test your application by using in circuit emulator.	C312.1	2
Q.1.8.	Analyze the mode of timer.	C312.1	4
Q.1.9.	Differentiate general purpose computers & embedded systems	C312.1	1,2
Q.1.10.	Explain the top down approach of building embedded systems	C312.1	1
Q.2.1.	Explain the classification of I/O devices	C312.2	2
Q2.2.	Explain use of each control bit of I2C bus protocol	C312.2	2
Q.2.3.	Compare advantages and disadvantages of data transfer using serial and parallel ports or devices	C312.2	2
Q2.4.	What do you meant by buses for networking of serial devices and parallel devices?	C312.2	5
Q.2.5.	What are the serial bus communication protocols? Explain any two of them.	C312.2	5
Q.2.6	What are the factors which supports the devices driver requirement?	C312.2	1,2
Q.3.1.	What is EDLC?Why EDLC is essential in embedded production development	C312.3	1,2
Q.3.2.	Explain the different life cycle models adopted in embedded product development	C312.3	1,2,5
Q.3.3.	What are the challenges in product integration and how to test the product	C312.3	1,2
Q.3.4.	How the performance tool helps in analyzing the performance of the system.	C312.3	1,2
Q.3.5.	What are the UML diagrams involved in conceptual design?	C312.3	1,3
Q.4.1.	What should be the goal of an OS?	C312.4	1,5
Q.4.2	When do you use cooperative scheduling and When preemptive?	C312.4	2
Q.4.3	Compare V_X works,µ/OS-II,RI Linux	C312.4	2,5
Q.4.4	List ten examples, each of applications of semaphore, mailbox and message queue.	C312.4	2,5
Q.4.5	How do you initiate preemptive scheduling and assign priorities to the tasks for scheduling? Give ten example of the need for preemptive scheduling.	C312.4	3
Q.4.6	Explain the strategies to achieve synchronization between two processes.	C312.4	5
Q.4.7	Write notes on multiprocessing and multi tasking.	C312.4	2
Q.4.8	How to calculate the deadline for periodic and a periodic processes?	C312.4	2
Q.4.9	Write about priorities and vectors.	C312.4	2
Q.4.10	What is blocking and non blocking communication?	C312.4	1,2
Q.5.1	Briefly explain the various embedded system application developments in real time.	C312.5	1,6,7
Q.5.2	Describe the design of smart card	C312.5	1,2,3
Q.5.3	With neat sketch explain the mechanism involved in washing machine control.	C312.5	1,2,3
Q.5.4	Explain the case study of automotive application.	C312.5	1,2,3
Q.5.5	Discuss the list of task function and IPCS in automotive applications	C312.5	1,2
A.1.1.	1. Classify the embedded system based on applications. 2. How to select microcontrollers and memories for your own designing applications with example	C312.1	1,2,3,5
A.2.1.	1.List out the I/O devices and how to interface I/O devices with micro controller? 2.Explain interfacing sensors by using SPI with any one example.	C312.2	1,2,3
A.3.1.	1. Discuss about the issues in hardware and software co-design with any one example. 2.Explain about the advantages of Object Oriented Model for embedded development environment	C312.	1,2,3

K.L.N. College of Engineering

Department of Electrical and Electronics Engineering

EE 6603- POWER SYSTEM OPERATION AND CONTROL [C313]

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

1. Course outcomes*

Course	Course outcomes	POs
C313.1	Analyze the various load characteristics with load curve and load duration curve. (K4)	1,2,5
C313.2	Describe modeling of power-frequency dynamics and design power-frequency controller (K3)	1,2,3,4,5
C313.3	Explain the modeling of reactive power-voltage interaction and the control actions (K3)	1,2,3,4,5
C313.4	Solve economic dispatch problems and unit commitments problems in power systems (K3)	1,2,3,4,5
C313.5	Explain the need of computer controls to energy management using SCADA. (K2)	1,2,5

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
C313.1	3	2	-	-	1	-	-	-	-	-	-	-	1	-	-
C313.2	3	2	1	2	1	-	-	-	-	-	-	-	2	-	-
C313.3	3	2	1	2	1	-	-	-	-	-	-	-	2	-	-
C313.4	3	2	1	2	1	-	-	-	-	-	-	-	2	-	-
C313.5	1	2	-	-	1	-	-	-	-	-	-	-	1	-	-
C313	3	2	1	2	1	-	-	-	-	-	-	-	2	-	-

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.	A generating station has maximum demand of 400 MW. The annual load factor is 65% and capacity factor is 50% find the reserve capacity of the plant.	C313.1	1,2
Q.1.2.	(i)Discuss about the recent trends in real time control of power systems. (ii) Write short notes on load forecasting.	C313.1	1,2
Q.1.3.	Explain the term Installed reserve, Hot reserve and cold reserve.	C313.1	1,2
Q.1.4.	Explain the need for voltage and frequency regulation in power system	C313.1	1,2

Q.1.5.	Define(i)Load Curve (ii)Daily Load Curve (iii)Monthly Load curve (iv)Annual Load Curve (v)Load Duration Curve, Write the formula of (i)Demand Factor (ii)Load Factor (iii)Diversity Factor (iv)Plant use Factor	C313.1	1,2
Q.1.6.	Differentiate between load curve and load duration curve with suitable example.	C313.1	1,2
Q.2.1.	Derive the expression of Speed-Load characteristics sharing of load between two synchronous machine.	C313.2	1,2
Q2.2.	Derive and explain the concept of two area load frequency control system modeling with necessary diagram.	C313.2	1,2
Q.2.3.	Draw and explain the concept of fundamentals of speed governing mechanism and derive the following(i)Model of Speed Governor (ii)Turbine Model (iii)Generator Load Model (iv)Model of Load frequency control of a single area system	C313.2	1,2
Q2.4.	Draw the necessary block diagram and derive the expression of dynamic analysis of uncontrolled case.	C313.2	1,2,3
Q.2.5.	Explain integral control of single area system for uncontrolled case (i)Static analysis (ii)dynamic analysis	C313.2	1,2
Q.2.6.	Derive and explain the concept of two area load frequency control system modeling with necessary diagram.	C313.2	1,2,3
Q.3.1.	Explain the functions of Excitation system and also explain any two types of excitation system with neat block diagram.	C313.3	1,2
Q.3.2.	Explain typical excitation system or Typical brushless Automatic Voltage Regulator.	C313.3	1,2
Q.3.3.	Explain the Voltage control with suitable example and mention its advantages	C313.3	1,2
Q.3.4.	Derive and justify the static and dynamic analysis of Automatic Voltage Regulator loop.	C313.3	1,2.,3
Q.3.5.	Explain the concept of tap chancing transformer with its type.	C313.3	1
Q.3.6.	i)Discuss in brief about generation and absorption of reactive power. (ii) Derive the relations between voltage, power and reactive power at a node for applications in power system control.	C313.3	1,2,3
Q.4.1.	State Unit Commitment problem – Define spinning reserve, thermal unit constraints, hydro constraints, fuel constraints and other constraints.	C313.4	1,2
Q.4.2.	Derive coordination equation for with loss and without loss in Economic dispatch method.	C313.4	1,2,3.
Q.4.3.	Explain the concept of dynamic programming method with flow chart and also explain its type.	C313.4	1,2
Q.4.4.	Draw the flow chart for λ-iteration method.	C313.4	1,2,3.
Q.4.5.	(i) Explain the unit commitment problem using priority ordering load dispatch. (ii) Explain the term 'Incremental Operating Cost' of power system related with economic dispatch	C313.4	1,2
Q.4.6.	The input output curve characteristics of three units are $F1=940+5.46PG1+0.0016PG1^2$ $F2=820+5.35PG2+0.0019PG2^2$ $F3=99+5.65PG3+0.0032PG3^2$. Total load 600MW. Use the participating factor method to calculate dispatch for a load is reduced to 550MW	C313.4	1,2,3.
Q.5.1.	Explain the hardware components and fundamentals of SCADA using a fundamental block diagram.	C313.5	1,2
Q5.2.	Explain the Energy Control Centre function using SCADA.	C313.5	1,2
Q.5.3.	Define State Estimation and explain the classifications of state estimation	C313.5	1,2
Q.5.4.	List the various contingencies that are generally considered for steady sate security analysis. Explain the major functions of system security control	C313.5	1,2
Q.5.5.	Explain various state transitions and control strategies using state transition diagram.	C313.5	1,2
5. Tutorial Questions.			
T.1.1.	i)Explain about the over view of power system operation. ii) A generating station has the following daily load cycle	C313.1	1,2,3

Time(hr)	0-6	6-10	10-12	12-16	16-20	20-24
Load(MW)	20	25	30	25	35	20

a)Draw the Load duration curve b)Maximum demand(ans-35KW)
c)Units generated per day(ans 600x3kwhr) d)Average load(ans 25000KW)
e)Load factor(ans 71.43%)

T.1.2.	A Power station has to meet the following demand Group A:200KW between 8A.M to 6P.M Group B:100KW between 6A.M to 10 A.M Group C:50 KW between 6A.M to10A.M Group D:100KW between 10A.M to 6P.M and 6P.M to 6A.M Plot the daily load curve and determine: i)diversity factor(ans 1.286)ii)units generated per day(ans 4600kwhr) iii)load factor(ans 54.76%)	C313.1	1,2,3
T.1.3.	A generating station has a maximum demand of 20MW, a load factor of 60%,a plant capacity factor of 48% and a plant use factor of 80%.calculate (i)the daily energy produced(ans-25000KW) (ii)the reserve capacity of the plant(ans-5000KW) (iii)the maximum energy that could be produced daily if the plant was running all the time(ans-480000KWhr) (iv)the maximum energy that could be produced daily if the plant was running fully loaded and operating as per schedule.(600000KWhr)	C313.1	1,2,3
T.1.4.	Explain the method of constructing a load duration curve using a load curve. The following data were collected from the daily load curves of a power system during a year	C313.1	1,2,3

Load in KW	Duration hours
15000	87
12000 and over	876
10000 and over	1752
8000 and over	2658
6000 and over	4380
4000 and over	7000
2000 and over	8760

Construct the annual load duration curve and find the load factor of the system.(ans-6.8)

T.2.1.	Considering the two area system, find the new steady-state frequency and change in tie-line flow for a load change of area 2 by 100MW, Assume following data for the system. Capacity of area 1 Pr1 =1000MWCapacity of Area 2 Pr2 =2000MW Nominal load of area 1,P_{D1} =500MW Nominal load of area 2,P_{D2} =1500 MW Regulation of area 1, R_1 =5% Regulation of area 2, R_2 =4% Nominal Frequency F^0 =50 Hz For both areas each percent change in frequency causes 1% change in load. Find also the amount of additional frequency drop if the interconnection is lost due to certain reasons. (ans-steady state value reduced to a value of 49.9029Hz and additional frequency drop is 0.0271Hz)	C313.2	1,2,3
T.2.2.	Consider two interconnected areas the incremental regulation of each area on its own base is equal to 0.1pu. The damping torque coefficient D for each on its own base is equal to 1 p.u. Assume that the system in initially at 60 Hz. Find the steady state change in system frequency and the steady state flow over the tie-line for the following situations.	C313.2	1,2,3

Load Change of 20MW in area	Total Capacity of area1	Total Capacity of area2

	1	1000MW	1000MW
	1	1500MW	500MW
	2	1500MW	500MW
	(case I ΔPtie1=-10MW,caseII ΔPtie1=-4.875MW,case III ΔPtie1=-5MW)		
T.2.3.	Two power systems A and B are interconnected by a tie-line and have power-frequency constants Ka and Kb MW/Hz. An increase in load of 500MW on system A calls a power transfer of 300MW from B to A,when the line is opened frequency of system A is 49Hz and system B is 50Hz.Determine the value of Ka and Kb. (ans –Ka=500Mw/Hz, Kb=750MW/Hz)	C313.2	1,2,3
T.2.4.	For the uncontrolled two- area system estimate the oscillating frequency of the system response following a disturbance in either area in the form of a step change in electrical load. Parameters for the two identical areas are given as Incremental Regulation R =250 Hz/p.u MW Inertia Constant H =5 secsDamping Coefficients=1.0pu Tie line operating power angle, δ_{10}-δ_{20}=45^0 Tie line capacity is 10% of area capacity. (Ans T_{12} =0.0707,f=0.295Hz)	C313.2	1,2,3
T.2.5.	Two 750KW alternators operates in parallel. The speed regulation of 1 set 100% to 103% from full load to no load and that of other is 100% to 104%.How will the two alternators share a load of 1000KW and at what load will one machine cease to supply any portion of the load. (ans PG1=464.28KW,PG2=535.7KW,cease supply 187.5KW)	C313.2	1,2,3
T.3.1.	If a load is with power factor of 0.8, find the power factor upto which improvement may be carried out economically. It is given that tariff for the consumer is Rs.80 per KVA+Rs.0.10 per KWH, cost of installing compensating equipment is Rs.350 per KVAR, rate of interest and depreciation on installation of compensating equipment is 10%.(ans-Improvement in power factor=0.899)	C313.3	1,2,3
T.3.2.	The load at the receiving end of a three-phase, overhead line is 25MW, power factor 0.8 lagging, at a line voltage of 33KV.A synchronous compensator is situated at the receiving end and the voltage at the both ends of the line is maintained at 33KV. Calculate the MVAR of the compensator. The line has resistance 5ohm per phase and inductive reactance(line to neutral)20ohm per phase. (Q rating of the compensator=33.09MVAR)	C313.3	1,2,3
T.3.3.	A three phase induction motor delivers 500 HP at an efficiency of 0.91, the operating power factor being 0.76 lagging. A loaded synchronous motor with a power consumption of 100KW is connected in parallel with the induction motor. Calculate the necessary KVA and the operating power factor of the synchronous motor if the overall power factor is to be utility. (ans-Reactive power-350.53KVAR,KVA of synchronous motor-364.5KVA)	C313.3	1,2,3
T.3.4.	Three supply points A, B and C are connected to a common busbar M. Supply point A is maintain at a nominal 275KV and is connected to M through a 275/132 KV transformer(0.1 p.u reactance) and a 132 KV line of reactance 50ohm .Supply point B is nominally at 132KV line of 50 ohm reactance. Supply point C is nominally at 275 KV and is connected to M by a275/132 KV transformers(0.1 p.u. reactance) and a 132KV line of 50ohm reactance. (ans-Natural voltage drop at M=5KV,reactive power injected to offset drop=38MVAR)	C313.3	1,2,3
T.3.5.	At a particular node of the power system network if the voltage falls from its nominal value by 2KV, estimate the amount of MVAR to be injected at the node. It is given that three-phase short circuit current at that node is about 5KA. (ans-MVAR to be injected to maintain the voltage=10MVAR)	C313.3	1,2,3
T.4.1.	The incremental cost characteristics of the plants are IC1=0.02P1+22 Rs/Mwhr IC2=0.04P2+20 Rs/Mwhr	C313.4	1,2,3

	The system load is entirely concentrate at plant 2.For transfer of 80MW from plant 1 to plant 2 the transmission loss is found to be 14MW.for this system compute optimum scheduling for a total received power of 150MW. (ans λ-25.75,P1=38.56MW,P2-143.75MW,P3=2.23MW)		
T.4.2.	The input output curve characteristics of three units are F1:750+6.49P_{G1}+0.0035P_{G1}^2F2: 870+5.75P_{G1}+0.0015P_{G1}^2 F3: 620+8.56P_{G1}+0.001P_{G1}^2 The fuel cost of unit 1 is 1Rs/MBtu for unit 2 and 1Rs/MBtu for unit3.Total load is 800MW.Use the participation factor method to calculate the dispatch of load is increased to 880MW. (ans-$P_{new,1}$ =394.17MW, $P_{new,2}$=331.04MW, $P_{new,3}$=154.076MW)	C313.4	1,2,3
T.4.3.	A power plant has three units with the following cost equations $C_1 = 0.02P_1^2 + 1.95\ P_1 + 100$ Rs/hr $C_2 = 0.015\ P_2^2 + 2.10\ P_2 + 120$ Rs/hr $C_3 = 0.005\ P_3^2 + 2.20\ P_3 + 130$ Rs/hr Find the optimum scheduling for a total load of 300 MW. (ans- P1=52.126MW,P2-64.36MW,P3-183.506MW)	C313.4	1,2,3
T.4.4.	The incremental cost curve of three units are P1= -150+50(IC)-2$(IC)^2$ P2= -100+50(IC)-2$(IC)^2$ P3= -150+50(IC)-2$(IC)^2$ Where IC=dFi/dPi; Rs/Mwh i=1,2,3 The total demand at a certain hour of the day equals 200MW; find the optimum allocation of load between three units using λ-iteration method. (ans λ-5,P1=50MW,P2-100MW,P3-50MW)	C313.4	1,2,3
T.4.5.	A Power plant has 3 units with the following characteristics $F_1 = 0.05P_1^2 + 21.5\ P_1 + 800$ Rs/hr $F_2 = 0.10\ P_2^2 + 27\ P_2 + 500$ Rs/hr $F_3 = 0.07\ P_3^2 + 16\ P_3 + 900$ Rs/hr Pmax=120MW,Pmin=39MW. (ans-P1=71MW,P2=39MW,P3=90MW)	C313.4	1,2,3
	6.Assignments/Seminar/Self study topics.		
A.1.1.	A Power station has a maximum demand of 15000KW,a load factor of 70% a plant capacity factor of 52.5% and plant use factor of 85%.Fine (a)the daily energy produced,(b)the reserve capacity of the plant (c)the maximum energy that could be produced daily if the plant were use in all the time (d)the maximum energy that could be produced daily if the plant, operating in accordance with operating schedule, is fully loaded when in operation.	C313.1	1,2,3
A.1.2.	Explain the method of constructing a load duration curve using a load curve. The following data were collected from the daily load curves of a power system during a year Load in KW / Duration hours 15000 / 87 12000 and over / 876 10000 and over / 1752 8000 and over / 2658 6000 and over / 4380 4000 and over / 7000 2000 and over / 8760 Construct the annual load duration curve and find the load factor of the system.	C313.1	1,2,3
A.1.3.	A diesel station supplies the following loads to various consumer Industrial load=1500KW Commercial load=750KW Domestic Power=100KW	C313.1	1,2,3

	Domestic light=450KW If the maximum demand on the station is 2500KW and the number of KWhr generated per annum is $45x10^5$,determinethe diversity factor and annual load factor.		
A.2.1.	Two identical synchronous machine of rating 100MW,50Hz operating in parallel have the following characteristics Machine 1:speed droop is 4%,speed changer set to give 50% rated load at rated speed. Machine 2: speed droop is 4%,speed changer set to give 75% rated load at rated speed. (a)Determine the load taken by each machine for a total load of 150MWand the frequency of operation. (b)Conclude about the adjustments to be made by the speed changers of the machines to share the load as in(a)but with a frequency of 50Hz.	C313.2	1,2,3,4
A.2.2.	Two generators rated at 150MW and 250MW are operating in parallel. The governor settings on the machines are such that they have 4 percent and 3 percent drops. Determine (i)the load taken by each machine for a total load of 200MW (ii)The percentage no load and rated output of machine 1 to be made by the speeder motor if the machines are to share the load equally.(iii)Rated output of machine 1.	C313.2	1,2,3
A.2.3.	Two 1000KW alternators operate in parallel. The speed regulation of 1 set is 100% to 104% from full load to no load and that of other is 100% to 105%.How will the two alternators share a load of 1200KW and at what load will one machine cease to supply any portion of the load.	C313.2	1,2,3
A.4.1.	There are 3 thermal generating units which can be committed to take the system load of 800 MW. The fuel cost data and generation operating limit data are given below. With the data provided, analyzethe optimum unit committed using brute force enumeration technique. $F_1 = 0.006P_1^2 + 7\ P_1 + 600 \quad 100 \le P_1 \le 600$ $F_2 = 0.01\ P_2^2 + 8\ P_2 + 400 \quad 50 \le P_2 \le 300$ $F_3 = 0.008\ P_3^2 + 6\ P_3 + 500 \quad 150 \le P_3 \le 500$	C313.4	1,2,3,4
A.4.2.	A constant load of 300MW is supplied by 2 generators having a capacity of 200MW each. The respective incremental fuel costs are. $dC_1/dP_{G1} = 0.1\ P_{G1} + 20$ Rs/MWhr $dC_2/dP_{G2} = 0.12\ P_{G2} + 15$ Rs/MWhr Compute the most economical division of load between the generators using lambda iteration method and verify the results with C program.	C313.4	1,2,3,5
A.4.3.	Considering following 3 units $IC_1=7.92+0.003124\ P_{G1}$ $IC_2=7.85+0.00388\ P_{G2}$ $IC_3=7.97+0.00964\ P_{G3}$ $P_D=850$MW $P_{G1}=393.2$MW, $P_{G2}=334.6$MW; $P_{G3}=122.2$MW Determine the optimum schedule if the load is increased to 900MW by using participation factor method? Also apply any of the modern appropriate optimization algorithm to verify the results	C313.4	1,2,3,5
Seminar	Compare existing grid and smart grid	C313.5	1,2,3,5

K.L.N. College of Engineering

Department of Electrical and Electronics Engineering

EE 6604 - DESIGN OF ELECTRICAL MACHINES [C314]

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

1.Course outcomes

Course	Course outcomes	POs
C314.1	Compare Electrical Engineering materials; determine heat dissipation due Conduction, convection and radiation**.**	1,2,3,5
C314.2	Calculate mmf for slots and teeths, apparent flux density, main dimensions and winding details of DC machines.	1,2,3,5
C314.3	Design core, yoke , winding and cooling system of transformers.	1,2,3,5
C314.4	Develop output equation of AC machines, design stator and rotor of induction machines.	1,2,3,5
C314.5	Design stator and rotor of synchronous machines analyze their thermal behavior, design field systems for turbo alternators.	1,2,3,5

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
C314.1	3	3	3	-	2	-	-	-	-	-	-	-	2	1	-
C314.2	3	3	3	-	2	-	-	-	-	-	-	-	2	1	-
C314.3	3	3	3	-	2	-	-	-	-	-	-	-	2	1	-
C314.4	3	3	3	-	2	-	-	-	-	-	-	-	2	1	-
C314.5	3	3	3	-	2	-	-	-	-	-	-	-	2	1	-
C314	3	3	3	-	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.

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.

S.No.	**4. Important Questions.**	COs	POs
Q.1.1.	Define design.What are the factors those limit the design of a machine .Describe the major considerations to evolve a good design?	C314.1	2,3
Q.1.2.	Classify various electrical conducting materials, their properties ,requirements, and uses. Show that use of aluminium conduction in electrical machines instead of equivalent copper conduction results in reduction of rating by 22%.	C314.1	1,2
Q.1.3.	Describe the various types of magnetic materials, their properties ,requirements, and uses. What do you mean by "Ageing"? What are dynamo grade steel, CRGOs and transformer grade steel? Which magnetic materials are used in chokes and current Tr.?	C314.1	1
Q.1.4.	Explain the various types of insulating materials based on temperature rise, their properties ,requirements, and uses. Which insulating materials are used in modern EM.?	C314.1	1
Q.1.5.	Compare the various modes of heat dissipation. Develop an expression for heat dissipation by conduction, convection and radiation. Give real time examples.	C314.1	1
Q.1.6.	Develop an expression to find hotspot temperature. Develop an expression for heat produced in the coil of an electrical machine considering the flow in two dimensions. Find a relation between the effective thermal resistivity of winding, thermal resistivity of insulation and space factor in electrical machines. Define space factor.	C314.1	1
Q.1.7.	Derive the equation of temperature rise with time in electrical machines. What is heating time constant. Show that the cooling curve of electrical machines is exponential in nature. Define cooling time constant.	C314.1	1,2
Q.1.8.	Define "Rating" of an electrical machine. Classify the different duties and rating of electrical machines with their respective temperature-time curves. Distinguish between continuous duty and short time duty with examples.	C314.1	1,2
Q.1.9.	Describe any two methods used for determination of motor rating for variable load drives with suitable diagram.	C314.1	1
Q.1.10.	Define specific Electric and magnetic loading. What are the choices of specific electric and magnetic loadings.	C314.1	1
Q.2.1.	Write Ohms law of magnetic circuit. Derive an expression for reluctance of series and parallel magnetic circuit. What are the similarities and differences between Electric and magnetic circuits?	C314.2	1
Q2.2.	Develop an expression for mmf of airgap of (a)smooth armature(b)slotted armature	C314.2	1
Q.2.3.	What are the problems associated with the calculation of mmf for teeth? Explain the methods of determination of mmf for teeth.	C314.2	1
Q2.4.	Distinguish between apparent and real flux density. Derive an expression for apparent flux density interms of real flux density. Define stacking factor.	C314.2	1
Q.2.5.	Develop an expression for the output equation of DC machines. How will you separate D,L for DC machines. What is meant by square pole criterion? Mention the guidelines for the selection of number of poles of DC machines.	C314.2	1
Q.2.6.	Describe the design details of the armature of a DC machines for lap and wave windings. Determine the diameter and length of the armature core for 55kW,110V,1000rpm,4pole, DC Shunt generator, assuming specific electric and magnetic loading of 26,000 Amp.Cond/m and 0.5Wb/m^2 respectively. The pole arc should be about 70% of pole pitch and length of core is about 1.1 times the pole arc. Allow 10A for field current and assume a voltage drop of 4V for armature circuit. Specify the winding used and also determine suitable values for the number of armature conductor and No,of slots. (D=0.36m, L=0.217m, S_a=38slots,C=38coils,Z=228Conductors,Cond/Slot=6,T_c =3T)	C314.2	1,2,3
Q2.7.	(a).Describe the procedure for the design of commutator and brushes for DC machines. What are the commutator losses? Name the materials of commutator and brushes. (b).Determine total commutator loss for 1000kW,500V,800rpm,10 pole generator,given that commutator diameter=1.0m,current density at brush contact =75X10^{-3}A/mm^2.Brush pressure is 14.7kN/m^2.Coefficient of friction =0.28, Brush contact drop=2.2Volt.(13.6KW)	C314.2	1,2,3

	(c). Design a suitable Commutator for a 350kW,600rpm,440V,6pole,DC generator having an armature diameter of 0.75m,No.of coils is 288.Assume suitable values wherever necessary.		
Q.2.8.	Explain various steps involved in the design of shunt field winding of DC machine.	C314.2	1
Q.3.1.	Derive an expression for the output equation of a single-phase and three phase transformer interms of core and window area. Develop the equation of voltage per turn interms of rating of the transformer. Write the design details of winding of single and three phase transformer.	C314.3	1
Q.3.2.	Explain the design aspects of transformer core. Draw square core section, cruciform core and three stepped core. Give the relationships among the physical dimensions involved in the three cases. Draw and show the overall dimensions of single, three phase core type and shell type transformers.	C314.3	1,2
Q.3.3.	Calculate the core and window area for a 1000kVA,6600/400V,50Hz,1φ core type transformer. Assume a maximum flux density of 1.25Wb/m^2 and a current density of 2.5A/mm^2. Voltage/turn =30V Window space factor is 0.32.	C314.3	1,2.,3
Q.3.4.	Determine the dimensions of yoke, core for a 200kVA,50Hz,1φ core type transformer. A cruciform core is used with distance between adjacent limb is equal to 1.6times the width of core lamination. Assume emf/turn as 14Volts, maximum flux density is 1.1Wb/m^2,window space factor=0.32,current density =3A/mm^2.Stacking factor is 0.9.The net iron area is $0.56d^2$ in a cruciform core where d is the diameter of the circumscribing circle. Also width of the largest stamping is 0.85d.	C314.3	1,2.,3
Q.3.5.	Explain the design procedure of cooling tubes for a transformer.	C314.3	1
Q.3.6.	How will you estimate no-load current in single phase and three phase transformers?	C314.3	1
Q.3.7.	A 1ϕ, 440V, 50HZ, Transformer is built from stampings having a relative permeability of 1000. The length of flux path is 2.5m; area of C.S of core = 2.5 X $10^{-3}m^2$; Primary winding has 800 turns. Estimate the maximum flux and no load current of Transformer. The iron loss at working flux density is 2.6 watts/Kg, iron weighs, 7.8 X 10^3 Kg / m^3, stacking factor = 0.9.(I_o =1.61A)	C314.3	1,2,3
Q.4.1.	Develop the Output equation for rotating AC machines. How will you separate D&L for the rotating AC machines?. Describe the design details of stator winding.	C314.4	1
Q.4.2.	Calculate specific electric and magnetic loading of a 100 HP,3000V,3φ,50Hz,8pole,star connected, flame proof induction motor having stator core length 0.5m,stator bore is 0.66m.Take turns/phase=286. Assume full load efficiency=0.938,power factor=0.86.	C314.4	1,2,3.
Q.4.3.	Describe the design details of rotor bars and end rings of squirrel cage &slip ring IM.	C314.4	1
Q.4.4.	Design a cage rotor for a 40HP,3φ,400V,50Hz,6pole,delta connected, induction motor. A full load efficiency of 87%,and a full load power factor of 0.85 may be assumed. Take D=33cm ,L=17cm, Stator slots=54,conductor/slot=14.	C314.4	1,2,3.
Q.4.5.	A 3φIM,has 54stator slots with 8conductor/slot and 72 rotor slots with 4 conductors/slot.Find the No.of stator and rotor turns.Find the voltage across the slip rings when the rotor is open circuited and at rest. Both stator and rotor are star connected and a voltage of 400V is applied across the stator	C314.4	1.
Q.4.6.	Discuss the points to be considered for estimating the length of air gap of an induction motor?	C314.4	1.
Q.5.1.	Develop an expression for the output equation of synchronous machine. How will you separate D&L for synchronous machines? What are the choice of B_{av} and ac for synchronous machine.	C314.5	1.
Q5.2.	The output co-efficient of a1250kVA,800rpm,synchronous generator is 200kVA/m^3-rps.(a).Find the values of main dimensions of the m/c, if L/D=0.2.(b).Also calculate the value of main dimension, if specific loading are decreased by 10%each,with speed remaining the same.(c).The speed is decreased to 150rpm with specific loading remaining the same as in (a).Assume same L/D. Comment on the result.	C314.5	1,2,3.
Q.5.3.	Describe the design details of rotor and field system of turbo alternator.(synchronous machines).	C314.5	1.
Q.5.4.	Describe computer aided design of electrical machines.	C314.5	1.
Q.5.5.	Describe the effect of dispersion co-efficient due to the following factors in an		

	induction motor: (a).Over load capacity (b).air gap length (c).Number of poles (d) frequency.		
	5. Tutorial Questions.		
T.1.1.	A copper bar 12 mm in diameter is insulated with micanite tube which fits tightly around the bar and into the rotor slots of an induction motor. The micanite tube is 1.5mm thick and its thermal resistivity is 8Ωm.Calculate the loss that will pass from copper bar to iron if a temperature difference of 25°C is maintained between them. The length of bar is 0.2m. (Diagram: Refer at the end) [19W]	C314.1	1,2,3
T.1.2.	A heat radiating body can be assumed to be spherical surface with co-efficient of emissivity =0.8.The temperature of the body is 60°C and that of the walls of the room, in which it is placed, is 20°C.Find the heat radiated from the body in W/m^2($224.6W/m^2$	C314.1	1,2,3
T.1.3.	A transformer core of plate width 0.5m and with a stacking factor of 0.94, has a uniformly distributed core loss of 3W/kg. The thermal conductivity of the steel is 150W/°C-m and the surface temperature is 40°C.Estimate the temperature of the hot spot if the heat flow is all to one end of the core.(ii).one half to the surface of each end. The heat flow is assumed to be along laminal. The density of steel plate is $7800kg/m^3$. (58.3°,44.6°)	C314.1	1,2,3
T.1.4.	A field coil has a cross section of $100X50mm^2$ and its length of mean turn is 1m.Estimate the hot spot temperature above that of outer surface of the coil, if the total loss in the coil is 120W.Assume stacking factor =0.56,resistivity=2Ω-m.(8.4°)	C314.1	1,2,3
T.1.5.	A field coil has a heat dissipating surface of $0.15m^2$ and a length of mean turn of 1m.It dissipates loss of 150W, the emissivity being $34W/m^2$-°C. Estimate the final steady temperature rise of the coil and its time constant, if the cross-section of the coil is $100X50mm^2$.Specific heat of copper is 390J/kg-°C. The space factor is 0.56.Copper weighs $8900kg/m^3$.	C314.1	1,2,3
T.1.6.	The temperature rise of transformer is 25°C after 1 hour and 37.5°C after 2 hours of energizing from cold conditions. Calculate its final steady temperature rise and the heating time constant. If this temperature falls from the final steady state value of 40°C in 1.5 hours when it is disconnected, calculate the cooling time constant. The ambient temperature is 30°C. (T_h=1.44 hours, T_c=0.932hrs.)	C314.1	1,2,3
T.2.1.	Calculate mmf required for the airgap of a machine having length=0.32m,including 4ducts of 10mm each,pole arc =0.19m,slot pitch =65.4mm,slot opening=5mm,airgap length=5mm,flux per pole=52mWb. Given Cater's coefficient is 0.18 for opening/ gap=1 and 0.28for opening / gap=2.width of the slot=5mm.(3590AT)	C314.2	1,2,3
T.2.2.	A 50 kW,220V,4pole,DC m/c has the following data:Armature diameter=0.25m, Length=0.125m,flux per pole=11.7mWb,length of airgap at pole centre=2.5mm,the ratio of pole arc to pole pitch =0.66. Calculate the mmf required for airgap (i).if the armature is treated as smooth.(ii).if the armature is slotted and the gap contraction factor is 1.18. (1,451AT,1712AT)	C314.2	1,2,3
T.2.3.	Determine the apparent flux density in the teeth of a DC m/c when the real flux density is 2.15Tesla.Slot pitch=28mm,slot width=10mm,gross core length=0.35m,No.of ventilating ducts=4,each 10mm wide.The magnetizing force for a flux density 2.15T is 55,000AT/m.The iron stacking factor=0.9.(2.215T.)	C314.2	1,2,3
T.2.4.	Estimate the main dimensions of a 4 pole ,100kW,1500rpm,DC generator, assuming a specific electric and magnetic loading as 19,000amp cond/m, and 0.4 Tesla respectively. Assume that the length of armature=pole pitch. (D=0.41m;L=0.318m.)	C314.2	1,2,3
T.2.5.	A 350kW,500V,450rpm,6pole,DC generator is built with an armature diameter of 0.87m&core length of 0.32m.The lap wound armature has 660 conductor. Calculate the specific electric & magnetic loading.(B_{av}=$0.69Wb/m^2$, ac=28,172 amp cond/m)	C314.2	1,2,3
T.2.6.	Calculate the main dimension of 20kW,1000rpm,DC motor. Given that B_{av}=0.37Tesla, ac=16,000amp.cond/m.Make the necessary assumption.(D=0.38m;L=0.14m)	C314.2	1,2,3
T.3.1.	Calculate kVA output of a 1φtransformer from the following data: Core height/Distance bt core centre=2.8;Diameter of circumscribing circle/Distance bt core centre=0.56.Net iron area/area of circumscribing circle=0.7,Current	C314.3	1,2,3

	density=2.33A/mm^2, Window space factor=0.27, frequency =50Hz,Flux density of core=1.2Wb/m^2,Distance between Core centres =0.4m.(454kVA)		
T.3.2.	Determine the main dimensions of core, No.of turns, cross sectional area of conductors for 5kVA, 11,000/400V,50Hz, 1φ,core type distribution transformer.The net conductor area in the window is 0.6 times net cross-sectional area of iron in the core. Assume a square core section for the core, flux density as 1Wb/m^2,currnt density as 1.4A/mm^2,and a window space factor=0.2,height of window is 3 time its width.(**W_w=0.0855m, H_w=0.2566m**, ∴ T_p=**6,769Turns, T_s=246**, a_p=0.454/1.4=0.32mm^2;a_s=8.928mm^2.)**,**	C314.3	1,2,3
T.3.3.	Calculate the overall dimensions of 200kVA,440V,50Hz,3φ core type transformer.The following data may be assumed.Emf/turn=10V,Max.flux density=1.3Wb/m^2,window space factor=0.3,current density=2.5A/mm^2,Stacking factor=0.9,Overall height=Overall width.Use 3 stepped core.(H=0.8635m=W)	C314.3	1,2,3
T.3.4.	A tank of a 1250kVA,natural oil cooled transformer has the dimension, length, width, height as 1.55x0.65x1.85m respectively. The full load losses is 13.1kW.Find the No.of tubes of the transformer, assuming the following:Loss dissipation due to radiation=6W/m^2-°C, Loss dissipation due to convection=6.5W/ m^2-°C, improvement in convection due to provision of tubes is 40%,temperature rise=40°C,length of each tube=1m,diameter of tube=50mm.Neglect the top and bottom surf of the tank as regards cooling .(164 tubes)	C314.3	1,2,3
T.3.5.	Calculate the active and reactive component of no load current of a 400V, 50 Hz, 1ϕ Tr. having the following particular core of Tr. Sheath; stacking factor = 0.9, density = 7.8 X 10^{3}Kg/m^3, length of the mean flux path = 2.2m, Gross iron section = 10 X 10^{-3}m^2; Py. Turn =200; joints = 0.2mm air gap. Use the following data.(Active comp, I_l = 0.502A;Reactive comp, I_m = 3.833A.)	C314.3	1,2,3

B_m	0.9	1	1.2	1.3	1.4
Mmf	130	210	420	660	1300
P_i(W/kg)	0.8	1.3	1.9	2.4	2.9

T.4.1.	Determine the approximate diameter and length of stator core, No. of stator slots and No. of conductors for a 11kW,400V,3φ,4pole,1425rpm,delta connected induction motor. Specific magnetic and electric loadings are0.45Wb/m^2 and 23,000 Amp.cond/m , respectively. Full load efficiency=0.85, Power factor=0.88.Ratio Pole arc to pole pitch =1.The stator employs a double layer winding. (D=0.191m,L=0.1496m,T_s=189Turns. S_s=36; Z_s=6T_s=1134;Z_{ss}=Z/S_s=32 conductors)	C314.4	1,2,3
T.4.2.	Estimate the core dimension,No.of stator slots and No.of stator conductors/slot for a 100kW,3300V, 12 pole,50Hz,Star connected, slip ring induction motor. B_{av}=0.4Wb/m^2, ac=25,000amp.cond/m,η=0.9, pf=0.9.Choose the main dimension to give best power factor. The slot loading should not exceed 500AT. (D=0.771m,L=0.23m. S_s=144,T_s=S_sxZ_{ss}=144 x20=2880conductors.)	C314.4	1,2,3
T.4.3.	Estimate the main dimension, airgap length, stator slots, stator turns per phase and cross sectional area of stator and rotor conductors for a 3φ,15HP,400V, 6pole, 50Hz,975rpm,induction motor. The motor is suitable for star-delta starting. B_{av}=0.45Wb/m^2,ac=20,000 amp. cond/m, L/τ=0.85,η=0.9,pf=0.85.(D=0.272m, L=0.1212m, l_g=0.563mm, T_s=243Turns, S_r=33.a_e=810.7/4x10^6=202.6mm^2.	C314.4	1,2,3
T.5.1.	Prove that for a m phase synchronous machine, the effective rotor volume , given by Volume=Qx 10^3/√2π^2B_{av}ac n_s .A rough estimate of the dimension and winding of 100MVA,11kV,3000rpmStar connected,3φ,turboalternator is required. The maximum value of flux density in the airgap of a machineis to be limited to 1Wb/m^2.The specific electric loading is 80,000 amp.cond./m.(i).Determine the approximate volume of the cylindrical part of the rotor.(ii).The peripheral speed of rotor is to be limited to 200m/sec.Estimate the required diameter and length.(iii)Estimate the No.of turns /phase. (Vol.=2.811m^3, D=1.273m, L=2.209m, T_{ph}=10turns.)	C314.5	1,2,3
T.5.2.	For a 250kVA,1100V,12pole,500rpm,3φ,alternator,determine the airgap diameter, core length, No.of stator conductors, No.of stator slots and cross section of stator conductor.	C314.5	1,2,3

<table>
<tr><td></td><td>Assume average airgap density as 0.6Wb/m^2,Specific electric loading of 30,000amp.cond./m.The alternator is star connected, the value of L/τ=1.5. (D=0.728m,L=0.285m, T_{ph}=88Turns;Z_s=528, S_s=72; $Z_{ss}=Z_s/S_s$=8, a_s=131.2/4=32.8mm^2)</td><td></td><td></td></tr>
<tr><td>T.5.3.</td><td>A 500kVA,3.3kV,10pole,3φ,Delta connected salient pole alternator has 180turns/phase.Estimate the length of airgap, if the average flux density is 0.54Wb/m^2.The ratio of pole arc to pole pitch is 0.66,SCR is 1.2.The gap contraction factor is 1.15.The mmf required for airgap is 80% of no load field mmf and the winding factor is 0.955. (l_g=2.99mm.)</td><td>C314.5</td><td>1,2,3</td></tr>
<tr><td>T.5.4.</td><td>6.Assignments/Seminar/Self study topics.</td><td></td><td></td></tr>
<tr><td>A.1.1.</td><td>(a).Modern methods of cooling of Turbo alternators(2pages-assignment),
(b).Effect of environmental factors on rating of machines(one page-self study)
(c). Embedded temperature detectors and modern methods of measurement of winding temperature(seminar).</td><td>C314.1</td><td>1,2,3,5</td></tr>
<tr><td>A.2.1.</td><td>A laminated tooth of armature steel in an electrical machine is 30mm long and has taper such that maximum width is 1.4times the minimum. Estimate the mmf required for a mean flux density of 1.9Wb/m^2 in this tooth.Use Simpson’s rule.The B-‘at’ curve for the material of tooth is (Ans: 865A.)
<table>
<tr><td>B(Wb/m^2)</td><td>1.6</td><td>1.8</td><td>1.9</td><td>2.0</td><td>2.1</td><td>2.2</td><td>2.3</td></tr>
<tr><td>‘at’(A/m)</td><td>3,700</td><td>10,000</td><td>17,000</td><td>27,000</td><td>41,000</td><td>70,000</td><td>109,000</td></tr>
</table></td><td>C314.2</td><td>1,2,3</td></tr>
<tr><td>A.2.2.</td><td>A 4 pole,25HP,500Volts,600rpm,series motor has an efficiency of 82%.The pole faces are square and the ratio of the pole arc to pole pitch is 0.67.Take B_{av}=0.55Wb/m^2, ac=17,000AT./m. Obtain diameter and length of the core and particulars of suitable armature winding.(D=0.337m,L =0.177m,Wave Winding, S_a=33slots, C=165coils, Z=990Conductors,Cond/Slot=30)</td><td>C314.2</td><td>1,2,3</td></tr>
<tr><td>A.2.3.</td><td>(a).Sketch the magnetic circuit of a DC machine and develop an expression for the mmf for various parts of it.
(b). A multipole DC m/c has the following dimensions.Cross section of the pole body=0.08m^2,height of pole =0.25m,cross section yoke=0.05m^2,mean flux path in yoke =0.9m(pole to pole),cross section of armature core =0.04m^2,length of flux path in core = 0.45m,(pole to pole),area of pole face =0.12m^2, length of airgap =5mm.There are 12 slots/pole and the width of each tooth is 15mm(40mm long).The length of the machine is 0.33m and pole arc to pole pitch is 0.67.Find the mmf per pole to give a flux of 0.1Wb.The relative permeability for teeth is 75 and for the rest of the magnetic circuit is 1200.Assume stacking factor of 0.9.Neglect leakage.(5189.167AT.)</td><td>C314.2</td><td>1,2,3</td></tr>
<tr><td>A.2.4.</td><td>Write a program in “C” to determine the main dimension of DC machine for T 2.4. [Ref:Page No.22.152,A.K.Sawhney]</td><td>C314.2</td><td>1,2,3,5</td></tr>
<tr><td>A.3.1.</td><td>(a).Modern methods of cooling of transformers.
(b). Write a program in “C” to design the core dimensions of single phase transformer. [Ref:Page No.22.10,A.K.Sawhney]</td><td>C314.2</td><td>1,2,3,5</td></tr>
<tr><td>A.4.1.</td><td>(a).Classify the types of leakage flux.
(b).Develop an expression for the calculation of leakage reactance of induction motor.
(c).Determine the specific permeance per metre length of a rectangular semi enclosed slot having the following dimension.Slot width=10mm,slot opening=4.5mm,height of conductor=26mm,height above conductor and below wedge=1mm,height of wedge=3.5mm.Limb height=1.5mm.The 3phase ,50 Hz machine has6poles, 3slots /pole/phase.The stator core length=0.12m and there are 225 turns/phase. Calculate the stator slot leakage reactance per phase.
(d). Write a program in “C” to calculate magnetizing current of three phase IM.</td><td>C314.4</td><td>1,2,3.5</td></tr>
</table>

K.L.N. College of Engineering
Department of Electrical and Electronics Engineering

EE6002- Power System Transients [C315E3]

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

1. Course outcomes

Course	Course outcomes	POs
C315E3.1	Explain the concept of transients and Compute the solution of transient current equation for RL and RLC system. (K2)	1,1
C315E3.2	Illustrate the importance of switching transients; Explain the concept of resistance switching, load switching and capacitance switching. (K4)	1,2,7
C315E3.3	Explain the concept of lightning mechanism, Describe the interaction between lightning and power system (K2)	1,2,6,7,8
C315E3.4	Apply the concept of reflection and refraction, Draw the Bewley Lattice diagram for different systems. (K3)	1,2,5
C315E3.1	Explain the concept of transients and Compute the solution of transient current equation for RL and RLC system. (K2)	1,2,5

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
C315E3.1	3	3	-	-	-	-	-	-	-	-	-	-	2	-	-
C315E3.2	3	3	-	-	-	-	2	-	-	-	-	-	2	-	1
C315E3.3	3	1	-	-	-	1	2	1	-	-	-	-	1	-	1
C315E3.4	3	1	-	-	2	-	-	-	-	-	-	-	1	1	-
C315E3.5	3	1	-	-	2	-	-	-	-	-	-	-	1	1	-
C315E3	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.

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.

S.No.	**4. Important Questions.**	COs	POs
Q.1.1.	Define Power system Transients? Derive the expression for transients due to Series and parallel RLC elements?	C315E3.1	1,2
Q.1.2.	With illustration, explain the various types of power system transients?	C315E3.1	1
Q.1.3.	Draw a simple circuit that produces transients? What are the sources, causes and effects of transients on power system? Explain them in detail?	C315E3.1	1
Q.1.4.	Elaborate your comment on double frequency transients on power systems?	C315E3.1	1
Q.1.5.	State and explain why transient study is importance in power system planning?	C315E3.1	1
Q.2.1.	Define switching transients? What is the need of resistance switching? With the equivalent circuit, explain the concept of resistance switching for interrupting the resistor current? Explain its significance in power system?	C315E3.2	1
Q2.2.	What is capacitance switching? What are the causes of capacitor inrush currents? Explain the theory of capacitance switching including the effect of source regulation. Also discuss the	C315E3.2	1

	effects of restrike and multiple re-strikes. Give an illustration for multiple re-striking transients?		
Q.2.3.	With appropriate waveform, explain the phenomenon of current suppression, current chopping, ferro resonance condition.	C315E3.2	1
Q2.4.	Define transient recovery voltage? Derive the expression and explain the characteristics of energy released by transformer when the magnetising current is chopped? Explain the switching in both normal and abnormal conditions with neat sketches.	C315E3.2	1,2
Q.2.5.	What is meant by subsidence transients? Draw and explain the waveforms for transient voltage across the load switch with equivalent circuit?	C315E3.2	1
Q.3.1.	What are the effects of lightning? What are the types of over voltages? Explain with neat sketches the mechanism of lightning discharge.	C315E3.3	1
Q.3.2.	What are the different types of strokes? Mention the different theories of charge formation and explain with neat diagrams the two different theories of charge generation in a thunder cloud.	C315E3.3	1
Q.3.3.	What is back flashover? Define isokeraunic level or thunderstorm days? Give the mathematical model for lightning discharges and explain them.	C315E3.3	1,2
Q.3.4.	Draw the lumped parameters equivalent circuits for lightning stroke to Tower? Explain the interaction between lightning and power system.	C315E3.3	1
Q.3.5.	Explain the significance of tower footing resistance? What are the factors that contribute good line design? Explain the protection offered by ground wires.	C315E3.3	1
Q.4.1.	How is the transmission lines classified? Explain the transient response of a system with series and shunt and lumped parameters	C315E3.4	1
Q.4.2.	What is surge impedance of a line and why is it also called the natural impedance? Why velocity of propagation over all overhead lines is same? Explain the travelling wave concept with step response.	C315E3.4	1
Q.4.3.	What do you mean by travelling waves? Define crest and front of a travelling wave? Distinguish between reflection and refraction of travelling waves. Derive the expression for reflection coefficient and refraction coefficient and explain the behavior of travelling waves at short circuited lines.	C315E3.4	1,2
Q.4.4.	Draw the lattice diagram for single transmission line terminated in impedance? Explain the Bewley's lattice diagram with an example.	C315E3.4	1
Q.4.5.	What is meant by switching surges? Define standing wave voltage ratio. Derive the wave equation and express the various parameters? Derive an expression for standing wave equation.	C315E3.4	1,2
Q.5.1.	What is meant by kilometric fault and explain the occurrence and effects in a power system	C315E3.5	1
Q.5.2.	Explain in detail about the switching surges on an integrated power system.	C315E3.5	1
Q.5.3.	What is meant by EMTP? Explain the network modeling and modeling of lumped parameters R, L & C for EMTP calculation.	C315E3.5	1
Q.5.4.	What are the causes of over voltage? Analyze and explain the causes of over voltages induced by various faults occurring in power system. Explain the voltage transients on closing and reclosing lines with expressions.	C315E3.5	1,2
Q.5.5.	Discuss the effects on power system due to Line dropping and load rejection.	C315E3.5	1
	6. Assignments/Seminar/Self study topics.		
A.1.1.	Explain with practical examples, what would happen if transients occur on power system?	C315E3.1	1
A.1.2.	From the equivalent circuit, how could you determine the double frequency transients on power systems	C315E3.1	1
A.2.1.	With the help of necessary equations, how would you justify that the energy is released by transformer when the magnetizing current is chopped?	C315E3.2	1
A.2.2.	Distinguish between resistance switching and capacitance switching?	C315E3.2	1
A.3.1.	Mechanisms of Lightning Injury (one page -assignment)	C315E3.3	1,6
A.3.2.	Lightning Safety Awareness (one page-self study)	C315E3.3	1,7,8
A.4.1	Simulation of transient response of systems with series and shunt lumped parameters and distributed lines using MATLAB (Seminar)	C315E3.4	1,5
A.5.1	Computation of transients using MATLAB (Seminar)	C315E3.5	1,5

Anna University Question Paper

COMMUNICATION ENGINEERING

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

Question Paper Code : 71457

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2015.

Fifth Semester

Electrical and Electronics Engineering

EC 2311/EE 54/10144 EE 501 — COMMUNICATION ENGINEERING

(Regulation 2008/2010)

(Common to PTEC 2311 – Communication Engineering for B.E. (Part Time)

Fifth Semester – Electrical and Electronics Engineering –(Regulation 2009))

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define the propagation constant of transmission line.
2. For a transmission line having incident voltage of 5V and reflected voltage of 3V, determine SWR.
3. What is shape factor?
4. Write any four primary applications of FDM.
5. Differentiate Bit rate and Band rate of digital modulation.
6. What are the four most common methods of pulse modulation?
7. What are the types of characters used in data communication codes?
8. List the channels and their data rate used in ISDN.
9. What are the primary advantages of optical fiber systems?
10. Define angle of elevation.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Define and derive the free space path loss. (6)

(ii) "Space wave propagation distance can be extended by increasing either the transmit or receive antenna height or both"– Justify the statement with the required diagrams and derivation. (10)

Or

(b) (i) With a neat diagram, explain the process of matching a load to a transmission line with a shorted stub.

(ii) Perform the phasor analysis of input impedance for a transmission line less than one quarter wavelength long.

12. (a) For an AM-DSBFC modulator with a carrier frequency $f_c = 100KHz$ and a maximum modulating signal frequency $f_{m(max)} = 10KHz$, Determine,

(i) Frequency limits for upper and lower side bands.

(ii) Bandwidth.

(iii) Upper and lower side frequencies produced when the modulating signal is a single-frequency $3KHz$ tone.

(iv) Draw the output frequency spectrum.

Or

(b) Explain the operation of Foster-seeley discriminator with the following.

(i) Schematic diagram

(ii) Vector diagrams for $fin = f_0$, $fin < f_0$ and $fin > f_0$.

13. (a) A PCM system has the following parameters: a maximum analog input frequency of $4KHz$ a maximum decoded voltage at the receiver of $\pm 2.55V$, and a minimum dynamic range of 46dB. Determine the following:

(i) Minimum sample rate

(ii) Minimum number of bits used in the PCM code

(iii) Resolution

(iv) Quantization error.

Or

(b) What is BPSK? With a neat block diagram, explain BPSK transmitter. Also analyze the Bandwidth considerations of BPSK.

14. (a) Determine the BCS for the following data and CRC generating polynomials:

data $G(x) = x^7 + x^5 + x^4 + x^2 + x + 1$

CRC $P(x) = x^5 + x^4 + x^1 + x^0$

Or

(b) What are the access control methodologies used in LAN? Explain the operation of Token Ring with the following.

(i) Token frame layout

(ii) MAC sublayer frame layout.

15. (a) Describe briefly and compare the three types of optical fiber configurations.

Or

(b) Discuss in detail about the frequency reuse concept of cellular network. Support your answer with the required diagrams.

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

Question Paper Code : 21457

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2015

Fifth Semester

Electrical and Electronics Engineering

EC 2311/EE 54/10144 EE 501 — COMMUNICATION ENGINEERING

(Regulations 2008/2010)

(Common to PTEC 2311 – Communication Engineering for B.E. (Part-Time) Fifth Semester – Electrical and Electronics Engineering – (Regulations 2009))

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Assume that a carrier $50 \sin 9800 \pi t$ is modulated using a single tone message $m(t) = 15 \cos 600 \pi t$. Plot the spectrum of

   (a) AM

   (b) DSB-SC.

2. Mention the differences between the Narrow band FM and Wide band FM.

3. Explain why a single channel PPM system requires a synchronizing signal, whereas PAM and PWM do not.

4. What is slope overload in Delta Modulation? Mention the techniques to overcome this.

5. An analog signal is band limited to BHz, sampled at the Nyquist rate, and the samples are quantized into 4 levels. The quantization levels Q_1, Q_2, Q_3 and Q_4 (messages) are assumed independent and occur with probabilities $P_1 = P_4 = 1/8$ and $P_2 = P_3 = 3/8$. Find the information rate.

6. Draw the NRZ and RZ signaling format of Binary sequences 11001.

7. What is direct sequence spread spectrum technique?

8. Draw the block diagram of pseudo random sequence generator.

9. Mention the different types of satellite orbits.

10. What are the losses associated with optical link?

PART B — (5 × 16 = 80 marks)

11. (a) (i) With a neat diagram derive the expressions for frequency spectrum of AM wave. (10)

(ii) Calculate the power relationship between the AM, DSB-SC, SSB-SC. Mention its % of power saving. (6)

Or

(b) (i) Using a suitable mathematical analysis, show that FM modulation produces infinite sidebands. Also derive an expression for the frequency modulated output and its spectrum. (12)

(ii) What is the relationship between FM and PM? (4)

12. (a) (i) Sketch the flat topped PAM waveform that results from sampling a 1 KHz sine wave at a 4 KHz rate. What is its drawback? (8)

(ii) With a suitable block diagram explain the operation of Delta modulation. (8)

Or

(b) (i) A 1.5 MHz information signal with a dynamic range of 64 mV is sampled, quantized and encoded using a direct binary code. The quantization is linear with 512 levels. Determine maximum possible bit deviation and amplitude of one quantization. (6)

(ii) With a necessary block diagram explain the QPSK transmitter. (10)

13. (a) Write short notes on :

(i) Average information and entropy (6)

(ii) Capacity of a Gaussian channel (6)

(iii) Bandwidth — S/N tradeoff. (4)

Or

(b) With the necessary diagrams explain the coding and decoding of block codes. (16)

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

Question Paper Code : 23379

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2015.

Fifth Semester

Electrical and Electronics Engineering

EC 1311 — COMMUNICATION ENGINEERING

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

(Regulation 2004)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the need for modulation?

2. For an AM superheterodyne receiver with IF, RF and LO frequency of 455 KHz, 600 KHz and 1055 KHz, determine the (a) Image frequency (b) Image frequency rejection ratio for a preselector Q of 100.

3. A cable has inductance of 15 nH/m and 85 pF/m at a specified frequency. What is the impedance?

4. Define the term 'maximum usable frequency'.

5. State the significance of 'bit error rate'.

6. Write the relationship between the minimum bandwidth required for an FSK system and the bit rate.

7. What kind of switching technique is employed in telephone networks?

8. List the merits of ISDN.

9. Define apogee and perigee.

10. State Snell's law.

PART B — (5 × 16 = 80 marks)

11. (a) With a block diagram, explain the functioning of super heterodyne radio receiver. Comment on the significance of each block. (16)

Or

(b) Describe the operation performed by various building blocks of a high -level AM transmitter with a neat sketch. Give the merits of AM over FM. (16)

12. (a) Discuss in detail about the types, equivalent circuit, losses and impedance matching of a transmission line.

Or

(b) (i) Explain the concept of ground wave propagation with its features, advantages and disadvantages. (10)

(ii) Discuss in detail about space wave propagation. (6)

13. (a) (i) Explain the generation and demodulation of PCM. (8)

(ii) Explain the TDM transmission and explain how this could be used to transmit a two or more messages. (8)

Or

(b) Explain the generation and bandwidth of the three types of binary modulated signals. (16)

14. (a) (i) What are the different types of data communication codes? Explain in detail. (10)

(ii) Brief about the OSI seven layer architecture. (6)

Or

(b) (i) With a neat sketch explain the principle, architecture and the various layers in ISDN. (10)

(ii) What is the need for equalizers in telephone circuits? (6)

15. (a) (i) Explain the satellite system link equations. (10)

(ii) State and explain the Kepler's law of planetary motion. (6)

Or

(b) (i) Explain the advantages of optical fibre communications. (6)

(ii) Explain the operation of any one light source and detectors. (10)

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

Question Paper Code : 73427

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2015.

Sixth Semester

Electrical and Electronics Engineering

EE 1351 — SOLID STATE DRIVES

(Common to B.E. (Part – Time), Fifth Semester Regulation 2005)

(Regulation 2004/2007)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. How are loads classified?
2. What is meant by acceleration mode of an electric drive?
3. What are the types of control strategies in a dc chopper?
4. State the advantages of DC chopper drives.
5. Why is the speed control of a 3ϕ induction motor with constant supply voltage and reduced supply frequency not preferred?
6. Draw the basic block diagram of closed loop drive.
7. Define self control mode of synchronous motor.
8. State the advantages of permanent magnet synchronous motors.
9. Write the purpose of current limit controller in a drive system.
10. Give any four factors to be considered for the selection of controller.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Derive the mathematical condition for steady state stability of equilibrium point. (6)

(ii) Based on the mathematical condition, examine the stability equilibrium points given in Fig. 11 (a) (ii). (10)

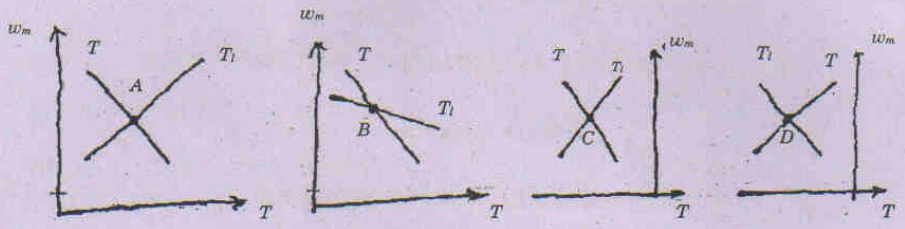

Fig. 11(a) (ii)

Or

(b) (i) Explain the multi quadrant dynamics in the speed-torque plane. (8)

(ii) A drive the following parameters : $J=10\,kg-m^2, T=100-0.1N$, N-m. Passive load torque T_l = 0.05 N, N-m where N is the speed in rpm. Initially the drive is operating in steady state. Now it is to be reversed. For this motor characteristic is changed to $T=-100-0.1N$, N-m. Calculate the time of reversal. (8)

12. (a) (i) Explain using a power circuit the working of a single phase semi converter fed separately excited motor drive. (8)

(ii) A separately excited dc motor operating from a single phase half controlled bridge at a speed of 1400 rpm has an input voltage of 330 sin $314t$ and a back emf of 80 V. The SCR are fired symmetrically at $\alpha=30^\circ$ in every half cycle. The armature has a resistance of 4 ohms. Calculate the average armature current and the motor torque. (8)

Or

(b) (i) Describe DC shunt motor can be made to both run as a motor and operate in the braking mode using a chopper. (8)

(ii) A dc shunt motor fed from 400 V dc source through a chopper has the following parameters. Ra = 0.02 ohms R_f = 0.04 ohms $k=5\times10^{-3}$ Nm/Amp^2. The average armature current of 300 Amps is ripple free F or a chopper duty cycle of 50% determine

(1) Input power from the source,

(2) Motor-speed and

(3) Motor torque. (8)

13. (a) Explain constant slip speed control of induction motors. (16)

Or

(b) (i) Derive the speed — torque characteristics of static slip power recovery scheme based induction motor drive. (8)

(ii) Explain the modes of operation of static Scherbius drive. (8)

14. (a) (i) Explain open loop v/f control of synchronous motor drives. What is the need of delay circuit in open loop v/f control? (8)

(ii) A 5000 kW, 3 phase 3.3 kV, 50 Hz, 0.8 (lagging) power factor, 4 pole, star connected synchronous motor has the following parameters $X_s = 15\ \Omega$, $R_s = 0$. Rated field current is 10 A. Calculate armature current and power factor at half the rated torque and field current. (8)

Or

(b) (i) Explain self control of synchronous motor drive operated with constant margin angle control. (10)

(ii) Write brief notes on different types of permanent magnet 4 - synchronous motors. (6)

15. (a) Write the step by step procedure and derive the transfer function of the DC motor and load system. (16)

Or

(b) Design a speed controlled DC motor drive maintaining the field flux constant. The motor parameters and ratings are as follows.

220 V, 8.3 A, 1470 rpm, Ra = 4 Ω, J = 0.0607 kg—m2, La = 0.072 H,

Bt = 0.0869 Nm/rad/sec Kb = 1.26 V rad/ see

The converter is supplied from 230 V, 3-phase AC at 60Hz. The converter is linear and its maximum control input voltage is ± 10 V.

The tachogenerator has the transfer function $G_w(s) = 0.065/(1 + 0.002_s)$. The speed reference voltage has a maximum of 10 V. The maximum current permitted in the motor is 20 A. (16)

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

Question Paper Code : 21510

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2015.

Sixth Semester

Electrical and Electronics Engineering

EE 2352/EE 62/10133 EE 602 — SOLID STATE DRIVES

(Regulations 2008/2010)

(Common to PTEE 2352/10133 EE 602 — Solid State Drives for B.E. (Part – Time) Sixth Semester Electrical and Electronics Engineering — Regulations 2009/2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is dynamic torque?

2. Draw the load torque characteristics of constant power loads.

3. Write down the speed torque equation of a single phase fully controlled converter fed separately excited dc motor drive.

4. What are the advantages of chopper fed dc drives over controlled rectifier fed dc drives?

5. Write the transfer function of converter in closed loop control of dc motor drives.

6. Write any two parameters of converter selection and characteristics.

7. Why is stator voltage control method suitable fan and pump drives?

8. What are the advantages of vector control over scalar control technique?

9. Why is frequency command applied through a delay circuit in open loop v/f control of synchronous motor drives?

10. What are the types of permanent magnet synchronous motor drives?

PART B — (5 × 16 = 80 marks)

11. (a) (i) A motor drives two loads. One has rotational motion. It is coupled through a reduction gear with a = 0.1 and efficiency of 90%. The load has a moment of inertia of 10 kg-m² and a torque of 10 N-m. Other load has a translational motion and consists of 1000 kg weight to be lifted up at an uniform speed of 1.5 m/s. Coupling between this load and the motor has an efficiency of 85%. Motor has an inertia of 0.2 kg-m² and runs at a constant speed of 1420 rpm. Determine equivalent inertia referred to the motor shaft and power developed by the motor. (10)

(ii) Explain the multi-quadrant operations of low speed hoist in speed torque plane. (6)

Or

(b) (i) Derive the mathematical condition for steady state stability of equilibrium point. (8)

(ii) Explain the operation of electrical drives in three different modes. (8)

12. (a) Give the steady state analysis of 3 phase controlled converter fed separately excited dc motor in continuous and discontinuous conduction modes. (16)

Or

(b) (i) A 200 V, 875 rpm, 150 A separately excited dc motor has an armature resistance of 0.06Ω. It is fed from a single phase fully controlled rectifier with an ac source voltage of 220 V, 50 Hz. Assuming continuous conduction, calculate

(1) Firing angle for rated motor torque and (-750) rpm

(2) Motor speed for $\alpha = 160^\circ$ and rated torque. (10)

(ii) Explain the four quadrant operation of chopper fed dc drives. (6)

13. (a) Derive the transfer function of separately excited dc motor with armature voltage control. (16)

Or

(b) Design the speed controller of converter fed separately excited dc motor with inner current control and outer speed control loops. (16)

14. (a) (i) A 2.8 kW, 400 V, 50 Hz, 4 pole, 1370 rpm, delta connected squirrel cage induction motor has following parameters referred to the stator: Rs = 2 Ω, $Rr' = 5\ \Omega, Xs = Xr' = 5\ \Omega, Xm = 80\ \Omega$. Motor speed is controlled by stator voltage control. When driving a fan load it runs at rated speed and rated voltage. Calculate motor terminal voltage, current and torque at 1200 rpm. (10)

(ii) Write short notes on energy efficient drives. (6)

Or

(b) (i) Explain constant air gap flux based closed loop v/f control technique of induction motor drive in detail with neat sketch and necessary equations. (8)

(ii) Make a detailed comparison between VSI and CSI fed induction motor drives. (8)

15. (a) (i) Explain the concept of self control in detail. (8)

(ii) Explain the open loop v/f control of synchronous motor drives. (8)

Or

(b) Explain the constant marginal angle control technique of self controlled synchronous motor drive employing load commutated thyristor inverter. (16)

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

Question Paper Code : 41214

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2015.

Seventh Semester

Electronics and Communication Engineering

EC 1316 — EMBEDDED SYSTEMS

(Common to EC 1306 A Embedded Systems for Fifth Semester Information Technology)

(Regulation 2008)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Write the real time constraints of embedded systems.

2. Mention the major hardware components used for the design of an embedded system.

3. What is RTC? State any two applications.

4. List the characteristic of synchronous communication.

5. State the function of queue pointers.

6. What is a cross compiler?

7. Differentiate process and thread.

8. State the principle of real time task scheduling.

9. Mention any four memory related functions.

10. What is the necessity for IPC in RTOS?

PART B — (5 × 16 = 80 marks)

11. (a) (i) With an example, explain the classification of embedded systems. (8)

(ii) Discuss the design possibilities of embedded systems on a chip. (8)

Or

(b) (i) Describe the important features of exemplary embedded systems. (10)

(ii) Discuss the concepts and types of software embedding into the system. (6)

12. (a) (i) Discuss on parallel port devices. (8)

(ii) Explain the hardware and software timer used in embedded systems. (8)

Or

(b) Explain the features of buses and the common modes used for parallel communication.

13. (a) (i) With example, explain the use of pointers in the execution of function calls. (8)

(ii) Explain the use of function queues in programming. (8)

Or

(b) (i) Explain the use of object oriented programming concepts in embedded programming. (8)

(ii) Explain how memory operations are optimized in embedded programming. (8)

14. (a) (i) Explain the file system organization and implementation in RTOS. (8)

(ii) Explain the principle of preemptive scheduling and its critical section service. (8)

Or

(b) (i) Explain the priority inversion problem and its solution. (8)

(ii) Describe the semaphore flag based interprocess communication. (8)

15. (a) Discuss the design considerations and functions of any one RTOS.

Or

(b) Explain the RTOS for multitasking in real time implementation with an example.

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

Question Paper Code : 41066

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2014.

Seventh Semester

Electrical and Electronics Engineering

10144 CSE 26 — EMBEDDED SYSTEM

(Regulation 2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is a real time embedded system?

2. Mention the types of memories in the system.

3. What is ARS application register set?

4. The memory map for an exemplary Embedded System, debit-credit card needs a 2KB memory. It also needs a 256 Byte RAM mainly for stacks. It also needs EEPROM 512 Byte for storing the balance amount. Write the memory map in the form of linker script program.

5. What is latency?

6. Mention any two non-maskable interrupts.

7. What is a Process Control Block?

8. What are the three important classes of devices in UNIX?

9. Mention the processor specific features in microcontrollers

10. Distinguish between Von-Neumann and Hardware architecture.

PART B — (5 × 16 = 80 marks)

11. (a) Discuss about the embedded systems design process in detail.

Or

(b) Elaborate on memory management methods.

12. (a) Explain the design of a real time robot control system

Or

(b) Discuss about device sensing without using an ISR and device driver ISR.

13. (a) Explain about multithreaded programming with examples.

Or

(b) Discuss clearly about semaphores in embedded systems.

14. (a) Elaborate on Unix as a Real Time Operating System.

Or

(b) Write about VxWorks, which can be perceived as a Real Time Operating System.

15. (a) Discuss about MBasic compiler and development boards.

Or

(b) With suitable interfacing diagram explain the PIC microcontroller based control of stepper motor. Also write assembly language program for the same.

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POWER SYSTEM OPERATION AND CONTROL

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

Question Paper Code : 71515

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2015.

Seventh Semester

Electrical and Electronics Engineering

EE 2401/10133 EE 701/EE 71 — POWER SYSTEM OPERATION AND CONTROL

(Regulation 2008/2010)

(Common to PTEE 2401/10133 EE 701 – Power System Operation and Control for B.E. (Part-Time) Fifth Semester – Electrical and Electronics Engineering – Regulation 2009/2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the need for load forecasting in a power system?
2. What are the advantages of computer control in power system? What are the types of computer control?
3. Find the open loop gain of an Automatic voltage regulator loop if the static error does not exceed 2%.
4. Brief the application of secondary ALFC loop in power system networks.
5. Show that the shunt compensation improves critical voltage as well as the power factor.
6. Distinguish between rotor angle stability and short-term voltage stability.
7. Find the incremental transmission losses for a two area power system, where the bus voltages are kept fixed and the line power flow is a function of line angle. Power loss is a function of generation of area B only.
8. What is spinning reserve?
9. What role SCADA plays in electrical power systems?
10. What are responsibilities of regional load dispatch centres?

PART B — (5 × 16 = 80 marks)

11. (a) Compare various stochastical methods of load fore casting.

Or

(b) Give a detailed account of online techniques for non-stationary load prediction.

12. (a) With the block diagram of speed governing system, explain the Automatic Load Frequency Control. Also derive necessary equations.

Or

(b) A sub-grid has total rated capacity 2500 MW. It encounters a load increase of 50 MW if the normal operating load is 1000 MW. Assume inertia constant (H) to be 5 sec and regulation of the generators in the system as 2 Hz/p.u MW. Find (i) ALFC loop parameters (ii) Static frequency drop, (iii) Transient response of the ALFC loop. Assume load frequency dependency to be linear.

13. (a) Derive the relation between voltage and real & reactive powers in a transmission line. Explain the voltage profile variation along the line as the reactive power varies.

Or

(b) Discuss at length, the effect of transformer on load tap changing on voltage stability.

14. (a) Determine the economic operation point for the three thermal units delivering a total load of 600 MW without considering generator limit as well as with considering generator limit.

Given;

Unit 1 : maximum output = 600 MW, minimum output = 150 MW

The fuel cost function is $F_1(P_1)=550+7.7P_1+0.00165\ P_1^2$ Rs/hr

Unit 2 : coal fired : maximum output = 500 MW, minimum output = 125 MW.

The fuel cost function is $F_2(P_2)=300+7.88P_2+0.002P_2^2$ Rs/hr

Unit 3 : coal fired : maximum output = 600 MW, minimum output =150 MW

The fuel cost function is $F_3(P_3)=80+7.99P_3+0.005P_3^2$ Rs/hr

Or

(b) What is priority list method of unit commitment? Explain it with an example.

15. (a) What is state estimation with respect to power system? Explain briefly the method of maximum likelihood weighted least squares estimation.

Or

(b) What is normal operating state of a power system? Describe in detail the various states that a power system takes, with their operating conditions.

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

Question Paper Code : 21515

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2015.

Seventh Semester

Electrical and Electronics Engineering

EE 2401/10133 EE 701/EE 71 — POWER SYSTEM OPERATION AND CONTROL

(Regulations 2008/2010)

(Common to PTEE 2401/10133 EE 701 — Power System Operation and Control for B.E. (Part-Time) Fifth Semester – Electrical and Electronics Engineering – Regulations 2009/2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the significance of load forecasting?

2. What is demand factor?

3. What is the advantage of AVR loop over ALFC?

4. What is meant by control area?

5. What is an exciter?

6. What is meant by stability compensation?

7. Draw incremental fuel cost curve.

8. Define crew constraints.

9. What are the states of power system?

10. What are the functions of control center?

PART B — (5 × 16 = 80 marks)

11. (a) Explain with help of block diagram the role of computers and implementation in power system control. (16)

Or

(b) A generating station has the following daily loads. (16)

Time (Hours) :	0-6	6-10	10-12	12-16	16-20	20-24
Load (MW) :	20	25	30	25	35	20

Sketch the load curve, load duration curve and determine

(i) Maximum demand

(ii) Units generated per day

(iii) Average load

(iv) Load factor.

12. (a) Derive the modeling of fundamental speed governing system. (16)

Or

(b) A two area power system has two identical areas with parameters and operating conditions: (16)

Rated capacity of the area = 1500MW

Normal operating load = 750MW

Nominal frequency = 50Hz

Inertia constant of the area = 5 s

Speed regulation = 3%

Damping co-efficient = 1%

Governor time constant = 0.06 s

Turbine time constant = 0.25 s

A load increase M1 = 30 MW occurs in area 1. Determine change in frequency and compare the change in frequency obtained in single area and comment on the support.

13. (a) Draw the circuit diagram for a typical excitation system and derive the transfer function model and draw the block diagram. (16)

Or

(b) Explain different types of static VAR compensators with a phasor diagram. (16)

14. (a) Draw the flow chart for obtaining the optimum dispatch strategy of N-bus system neglecting the system transmission loss. (16)

Or

(b) Obtain an optimum economic schedule of a three generators for a total load of 900MW. (16)

The details of fuel cost functions are given below.

$F_1 = 392.7 + 5.544\ P_1 + 0.001093\ P_1^2$,

$F_2 = 217 + 5.495\ P_2 + 0.001358\ P_2^2$,

$F_3 = 65.5 + 6.695\ P_3 + 0.004049\ P_3^2$,

P_1, P_2, P_3 in MW :

Generation limits

$150 < P_1 < 600$MW, $100 < P_2 < 400$ MW, $50 < P_3 < 200$ MW.

15. (a) Explain the hardware configuration and function of SCADA. (16)

Or

(b) Explain the different operating states in the security perspective with an example. (16)

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

Question Paper Code : 23431

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2015.

Seventh Semester

Electrical and Electronics Engineering

EE 1403 — DESIGN OF ELECTRICAL APPARATUS

(Regulations 2004/2007)

(Common to B.E. (Part-Time) Sixth Semester – Regulation 2005)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Distinguish between real and apparent flux densities in a DC machine.

2. Mention the various cooling methods commonly used for rotating electrical machines.

3. Give the need for inter poles in a DC Machine.

4. Compare wave winding with lap winding in a DC Machine.

5. What is window space factor in a transformer?

6. What are the factors on which no load current of a transformer depend?

7. Give the relationship between dispersion co efficient and over load capacity in an induction motor.

8. What is cogging? How it is avoided in induction motor?

9. Define short-circuit ratio of a synchronous generator.

10. State merits of computer aided design of electrical machines.

PART B — (5 × 16 = 80 marks)

11. (a) A laminated steel tooth of armature of a d.c. machine is 30 mm long and has a taper such that the maximum width is 1.4 times the minimum. Estimate the mmf required for a mean flux density of 1.9 wb/m² in the tooth. B-H characteristics of steel is given below : (16)

B_{wb/m^2} :	1.6	1.8	1.9	2.0	2.1	2.2	2.3
$H_{A/m}$:	3,700	10,000	17,000	27,000	41,000	70,000	1,09,000

Or

(b) Determine the apparent flux density in the teeth of a d.c. machine when the real flux density is 2.15 web/ms. Slot pitch is 28 mm, slot width is 10 mm and the gross core length 0.35 metre. The number of ventilating ducts is 4. Each duct is 10 mm wide. The magnetizing force for a flux density of 2.15 wb/m² is 55000 H/m. The iron stacking factor is 0.9. (16)

12. (a) Find the main dimensions of a 200 kW, 250 volts, 6 pole, 1000 rpm DC generator. The maximum value of flux density in the air gap is 0.87 wb/m² and the ampere conductors per metre length of armature periphery are 31000. The ratio of pole arc to pole pitch is 0.67 and the efficiency is 91 percent. Assume that the ratio of length of core to pole pitch = 0.75. (16)

Or

(b) A rectangular field coil of a dc machine is to produce an mmf of 7500 ampere turns when dissipating 220 watts at a temperature of 60°C. The inner dimensions of the coil are length = 0.24 metre. Width = 0.1 metre. Height of the coil = 0.15 metre. The heat dissipation is 30 w/m²/°C from the outer surface neglecting the top and bottom surfaces of the coil. The temperature of the ambient air is 20°C. Compute the thickness of the coil. Resistivity of copper is 0.02 Ω/m and mm². (16)

13. (a) Determine the dimensions of core mid yoke for a 200 KVA, 50 Hz single phase core type transformer. A cruciform core is used with distance between adjacent limbs equal to 1.6 times the width of core laminations. Assume voltage per turn of 14 volts, maximum flux density of 1.1 web/m², window space factor of 0.32, current density of 3 A/mm² and stacking factor equal to 0.9. The net iron area is 0.56 d^2 where d is diameter of circumscribing circle. Width of the largest stamping is 0.85 d. (16)

Or

(b) (i) Derive the output equation of a three phase transformer. (8)

(ii) State different methods of cooling the transformers and explain each method with relevant diagrams. State merits and limitations of each method.

14. (a) Determine the main dimensions, number of stator turns per phase, full load current, cross section of conductors and total I^2R loss of stator of a 120 kW, 2200 V, 3-phase, 750 rpm, 50 Hz, star connected slip-ring induction motor from the following particulars :

Average flux density in the gap = 0,47 Wb/m² Specific electric loading = 27000 ampere-conductors per metre; Efficiency = 93%; Power factor = 0.88; Winding factor = 0.955; current density = 5 A/mm² mean length of stator conductors = 77 cm; Resistivity = 0.021 Ω/m and mm² cross section. Choose the main dimensions to give a design for best power factor. (16)

Or

(b) (i) Bring out clearly, with the help of neat sketches, the differences between the 3-phase slip ring induction motor and the 3-phase squirrel cage induction motor. (8)

(ii) A 11 kW, 3 phase, 6 pole, 50 Hz, 220 V, star connected induction motor has 54 stator slots, each containing 9 conductors. Calculate the values of bar and end ring currents. The number of rotor bars is 64. The machine has an efficiency of 0.85 and a power factor of 0.86. The rotor mmf may be assumed as 87% of stator mmf. Also find the area of each bar and end ring if the current density is 5 A/mm². (8)

15. (a) (i) Derive the output equation of AC Machine. (8)

(ii) Discuss the effects of specific electric loading on the performance of Synchronous Machine. (8)

Or

(b) (i) Discuss the effects of Short Circuit Ration on Stability and Short Circuit Current of Synchronous Motor. (8)

(ii) Estimate the diameter and core length of a 15 MVA, 11 kv, 50 Hz, 2 pole star connected turbo alternator with 60° winding space spread. Assume Bay = 0.55 Wb/m²; ac = 36000 A/m and peripheral speed = 160 m/s. (8)

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

Question Paper Code : 71513

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2015.

Sixth Semester

Electrical and Electronics Engineering

EE 2355/EE 65/10133 EE 605 — DESIGN OF ELECTRICAL MACHINES

(Regulation 2008/2010)

(Common to PTEE 2355/10133 EE 605 – Design of Electrical Machines for B.E. (Part-Time) Fifth Semester – Electrical and Electronics Engineering – Regulation 2009/2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define specific electric loading.
2. What are the factors that affect the size of rotating machine?
3. Why square pole face if preferred?
4. Define copper space factor of a coil?
5. What are the advantages of stepped cores?
6. Why circular coils are preferred in transformer?
7. How the induction motor can be designed for best power factor?
8. Where mush winding is used?
9. Distinguish between cylindrical pole and salient pole construction.
10. How the dimensions of induction generator differ from that of an induction motor?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Discuss the advantages of hydrogen cooling. (8)

(ii) The exciting coil of an electromagnet has a cross section of 120 × 50 mm² and a length of mean turn 0.8m. It dissipates 150 W continuously. Its cooling surface is 0.125 m² and specific heat dissipation is 30 W/m²-°C. Calculate the final steady temperature rise of the coil surface. Also calculate the hot spot temperature rise of the coil if the thermal resistivity of insulating material used is 8Ωm. The space vector is 0.56. (8)

Or

(b) (i) Describe the classification of insulating materials used for electrical machines. (8)

(ii) The temperature rise of a transformer is 25°C after one hour and 37.5°C after two hours of starting from cold conditions. Calculate its final steady temperature rise and the heating time constant. If its temperature falls from the final steady value to 40°C in 1.5 hour when disconnected, calculate its cooling time constant. The ambient temperature is 30°C. (8)

12. (a) Explain various steps involved in the design of shunt field winding of dc machine. (16)

Or

(b) (i) Determine the air gap length of a dc machine from the following particulars : gross length of core = 0.12, number of ducts =one and 10mm wide, slot pitch = 25mm, slot width = 10mm, carter's coefficient for slots and ducts = 0.32, gap density at pole centre = 0.7 wb/m²; field mmf/pole = 3900AT, mmf required for iron parts of magnetic circuit = 800AT. (8)

(ii) A 5 kW, 250V, 4 pole, 1500 r.p.m. shunt generator is designed to have a square pole face. The loadings are :

Average flux density in the gap = 0.42 Wb/m² and ampere conductors per metre = 15,000. Find the main dimensions of the machine. Assume full load efficiency = 0.87 and ratio of pole arc to pole pitch = 0.66. (8)

13. (a) (i) Derive the output equation of single phase transformer in terms of core and window area. (8)

(ii) A 3 phase, 50Hz, oil cooled core type transformer has the following dimensions : Distance between core centers = 0.2m, Height of window = 0.24m. Diameter of circumscribing circle = 0.14m. The flux density in the core = 1.25Wb/m², the current density in the conductor = 2.5A/mm². Assume a window space factor of 0.2 and the core area factor = 0.56. The core is 2 stepped. Estimate kVA rating of the transformer. (8)

Or

(b) A 250kVA, 6600/400V, 3 phase core type transformer has a total loss of 4800W at full load .The transformer tank is 1.25 m in height and 1 × 5 m^2 in plan. Design a suitable scheme for tubes if the average temperature rise is to be limited to 35°C. The diameter of tubes is 50mm and are spaced 75mm from each other. The average height of tubes is 1.05m. Specific heat dissipation due to radiation and convection is respectively 6 and 6.5 W/m^2-°C. Assume that convection is improved by 35 percent due to provision of tubes. (16)

14. (a) Write short notes on : (16)

(i) Design of rotor bars and slots

(ii) Design of end rings.

Or

(b) A 15kW, 440V, 4 pole, 50 Hz, 3 phase induction motor is built with a stator bore 0.25 m and a core length of 0.16 m. The specific electric loading is 23000 ampere conductors per metre. Using the data of this machine, determine the core dimensions, number of stator slots and number of stator conductors for a 11 kW, 460V, 6 pole, 50 Hz motor. Assume a full load efficiency of 84 per cent and power factor of 0.82 for each machine. The winding factor is 0.955. (16)

15. (a) (i) Describe the construction of turbo alternator with neat sketch. (8)

(ii) For a 250kVA, 1100V, 12 pole, 500rpm, 3 phase alternator, determine core diameter and core length. Assuming average gap density as 0.6wb/m^2 and specific electric loading of 30,000 amp.cond/m, L/τ=1.5. (8)

Or

(b) Determine the output coefficient for a 1500kVA, 2200Volts, 3 phase, 10 pole, 50Hz, star connected alternator with sinusoidal flux distribution. The winding has 60° phase spread and full pitch coils. ac = 30000 amp.cond/m, Bav = 0.6 Wb/m^2. If the peripheral speed of the rotor must not exceed 100 m/sec and the ratio pole pitch to core length is to be between 0.6 and 1, find D and L. Assume an air gap length of 6 mm. Find also the approximate number of stator conductors. (16)

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

Question Paper Code : 91427

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2014.

Sixth Semester

Electrical and Electronics Engineering

EE 2027/EE 604/10133 EEE 16 — POWER SYSTEM TRANSIENTS

(Regulation 2008/2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is a transient?
2. Write the mathematical expression for transient due to RLC circuits?
3. What is Ferro resonance?
4. Why multiple restrike occur due to capacitance switching?
5. What is the rate of charging of thunder clouds?
6. What is a tower footing resistance?
7. What is a standing wave?
8. What is Bewely's lattice diagram?
9. Mention the features of EMTP.
10. What is a short line fault?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain the significance in the study of transients in the system planning. (10)

(ii) Write a short note on double frequency transients. (6)

Or

(b) Discuss in detail about the various types of power system transients. (16)

12. (a) Explain the transients due to load switching and develop the equivalent circuit. Also draw and explain the waveforms for transient voltage across the load and the switch. (16)

Or

(b) (i) Describe about the normal and abnormal switching transients. (8)

(ii) Write a short note on resistance switching and develop the equivalent circuit. (8)

13. (a) (i) Discuss the theory in the formation of clouds. (8)

(ii) Discuss the factors contributing to good line design. (8)

Or

(b) (i) Develop and describe the model for lightning stroke. (8)

(ii) Explain the characteristics of lightning stroke. (8)

14. (a) Discuss in detail about the reflection and refraction of traveling waves. (16)

Or

(b) Describe the transient response of systems with series and shunt lumped parameters. (16)

15. (a) (i) With a neat schematic diagram, explain the distribution of voltages in the power system. (10)

(ii) Explain briefly about the switching surges on integrated system. (6)

Or

(b) (i) Explain the occurrence of over voltages in power systems due to faults. (10)

(ii) Write short note line dropping and load rejection. (6)

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

Question Paper Code : 71487

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2015.

Sixth Semester

Electrical and Electronics Engineering

EE 2027/EE 604/10133 EEE 16 — POWER SYSTEM TRANSIENTS

(Regulation 2008/2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the causes of transients?
2. Write the basic transform of RLC circuit transient.
3. What is current suppression?
4. Define ferro resonance.
5. What are the types of protection afforded by ground wires?
6. Define tower footing resistance.
7. What is the importance of Bewley's Lattice Diagram?
8. Draw the equivalent circuit for an infinitesimal element of a line.
9. Distinguish between line dropping and load rejection.
10. Define kilo metric fault.

PART B — (5 × 16 = 80 marks)

11. (a) What are the various types of power system transients? With neat diagrams, describe any two types of power system transients in detail.(16)

Or

(b) (i) Discuss about the effects of transients on power systems. (8)

(ii) Briefly explain the importance of study of transients in planning. (8)

12. (a) (i) Explain the load switching in both normal and abnormal conditions with neat sketches. (8)

(ii) Explain current chopping with appropriate equivalent circuit. (8)

Or

(b) What is capacitance switching? Explain in briefly about capacitance switching with one and multiple restrikes. (16)

13. (a) (i) Explain in detail how the charges are formed in the clouds. (8)

(ii) With a neat sketch, explain the characteristics of lightning strokes. (8)

Or

(b) (i) Derive the mathematical model for lightning. (8)

(ii) Describe the interaction between lightning and power system. (8)

14. (a) Explain the steps involved in Bewley's Lattice diagram construction with an example. (16)

Or

(b) (i) Discuss transient response of systems with series and shunt lumped parameters and distributed lines. (8)

(ii) Derive the refraction coefficients of a traveling wave. (8)

15. (a) (i) Describe how the voltage is distributed in a power system. (8)

(ii) Derive the voltage transients on reclosing lines. (8)

Or

(b) Explain in detail how EMTP is used for the computation of transients in power system. (16)

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 will be 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						✓	✓	

Placement Recruitment – Requirement and Selection (PKA)

Reminders – SMK / Clerk

K.L.N.College of Engineering

Department of Electrical and Electronics Engineering.

Reminders/Remember these for peaceful career.

I. General

1. Keep at least 5 photocopies of birth certificate, ration card, Voters ID card, College ID card,Aadhar card, 10^{th} ,+2 mark sheets, 10^{th} /+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 6^{th} 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 un trusted 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, knilfe,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, 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 6^{th} 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 Dalailama 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 decides 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 metre (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.

Advanced Training Institute
Skill Development and Entrepreneurship Programmes
Ref: Advanced Training Institute,
CTI Campus, Guindy Industrial Estate, Chennai – 600 032.
Phone No.: 044- 2250 0252/1211, E mail : atichn@vsnl.com, www.ati.chennai.org.in

GROUP – I
ELECTRICAL CONTROL & MAINTENANCE

Course Coordinator

1. **Shri. M.S. Ekambaram, Dy.Director**
2. **Shri. C.C.Jose, Training Officer.**

Course Code	Course Title	Duration weeks	Date	
			From	To
01.01	Protective Relays, Circuit Breakers, & Switch Gear Protection	01	13.04.2015	17.04.2015
			18.05.2015	22.05.2015
			22.06.2015	26.06.2015
			27.07.2015	31.07.2015
			24.08.2015	28.08.2015
			21.09.2015	25.09.2015
			12.10.2015	16.10.2015
			07.12.2015	11.12.2015
			15.02.2016	19.02.2016
			21.03.2016	24.03.2016
01.02	Operation & Maintenance of Power Transformers	01	06.04.2015	10.04.2015
			11.05.2015	15.05.2015
			15.06.2015	19.06.2015
			20.07.2015	24.07.2015
			14.09.2015	18.09.2015
			30.11.2015	04.12.2015
			08.02.2016	12.02.2016
			07.03.2016	11.03.2016
			21.03.2016	24.03.2016
01.03	Trouble Shooting & Maintenance of Electric Motors	01	20.04.2015	24.04.2015
			08.06.2015	12.06.2015
			29.06.2015	03.07.2015
			03.08.2015	07.08.2015
			07.09.2015	11.09.2015
			23.11.2015	27.11.2015
			01.02.2016	05.02.2016
			29.02.2016	04.03.2016
01.04	Operation and Control of Industrial AC / DC Motors	01	25.05.2015	29.05.2015
			13.07.2015	17.07.2015
			17.08.2015	21.08.2015
			26.10.2015	30.10.2015
			18.01.2016	22.01.2016
			14.03.2016	18.03.2016
01.05	Electrical Safety at work place and first aid Practices	01	27.04.2015	01.05.2015
			01.06.2015	05.06.2015
			06.07.2015	10.07.2015
			10.08.2018	14.08.2015
			28.09.2015	01.10.2015
			14.12.2015	18.12.2015
			04.01.2016	08.01.2016
			22.02.2016	26.02.2016

GROUP – I
ELECTRONIC CONTROL & MAINTENANCE

Course Coordinator

1. **Dr.M.Jayaprakasan, Dy.Director**
2. **K.Arulselvi, Training Officer.**

Course Code	Course Title	Duration weeks	Date	
			From	To
02.01	Siemens S7 400 PLC & win CC SCADA / HMI – Programming (TIA portal)	02	13.04.2015	24.04.2015
			06.07.2015	17.07.2015
			14.09.2015	25.09.2015
			16.11.2015	27.11.2015
			01.02.2016	12.02.2016
02.00.2	PLC Siemens S7 400 Programming with step 7	01	15.06.2015	19.06.2015
			26.10.2015	30.10.2015
			04.01.2016	08.01.2016

			07.03.2016	11.03.2016
02.03	Maintenance & Servicing of SMPS and UPS	02	27.04.2015	08.05.2015
			20.07.2015	31.07.2015
			30.11.2015	11.12.2015
			15.02.2016	26.02.2016
02.04	Industrial Drives & Automation using Siemens PLC	02	15.06.2015	26.06.2015
			31.08.2015	11.09.2015
			18.01.2016	29.01.2016
02.05	Installation, Commissioning & Trouble Shooting of AC / DC Drives	01	18.05.2015	22.05.2015
			03.08.2015	07.08.2015
			18.01.2016	22.01.2016
02.06	PLC Siemens S7 400 Maintenance and Trouble Shooting	01	25.05.2015	29.05.2015
			10.08.2015	14.08.2015
			02.11.2015	06.11.2015
			21.03.2016	24.03.2016
02.07	Embedded System Programming & Applications (PIC 16F 877)	01	01.06.2015	05.06.2015
			24.08.2015	28.08.2015
			05.10.2015	09.10.2015
			14.12.2015	18.12.2015
02.08	Embedded Systems Programming & Applications (ARM 7 PLC 2378)	01	08.06.2015	12.06.2015
			28.12.2015	01.01.2016
02.09	Power Electronics and its Industrial Applications	02	20.07.2015	31.07.2015
			30.11.2015	11.12.2015

GROUP – I
PROCESS CONTROL INSTRUMENTATION

Course Coordinator

1. **Dr.M.Jayaprakasan, Dy.Director**
2. **M.Gunaseklharan, Training Officer.**

Course Code	Course Title	Duration weeks	Date	
			From	To
03.01	Agilent Veepro Graphical Programming for Industrial Instrumentation	01	13.04.2015	17.04.2015
			07.09.2015	11.09.2015
			23.11.2015	27.11.2015
03.02	Embedded System and its Application using P89C551rd2	01	20.04.2015	24.04.2015
			29.06.2015	03.07.2015
			05.10.2015	09.10.2015
			07.12.2015	11.12.2015
03.03	Industrial Automation using GE-GANUC PLC	01	18.05.2015	22.05.2015
			10.08.2015	14.08.2015
			28.12.2015	01.01.2016
			29.02.2016	04.03.2016
03.04	PLC Allen Bradley SLC 500 Programming & Applications	01	27.04.2015	01.05.2015
			13.07.2015	17.07.2015
			24.08.2015	28.08.2015
			26.10.2015	30.10.2015
			04.01.2016	08.01.2016
			15.02.2016	19.02.2016
03.05	Mixed Signal VLSI Design using PSOC	01	11.05.2015	15.05.2015
			07.09.2015	11.09.2015
			16.11.2015	20.11.2015
03.06	Configuration Networking & Troubleshooting of PLC	01	25.05.2015	29.05.2015
			17.08.2015	21.08.2015
			28.09.2015	01.10.2015
			18.01.2016	22.01.2016
			07.03.2016	11.03.2016
03.07	Testing and Calibration of Industrial Instruments (Pressure and Temperature)	01	01.06.2015	05.06.2015
			06.07.2015	10.07.2015
			07.09.2015	11.09.2015
			12.10.2015	16.10.2015
			30.11.2015	04.12.2015
			25.01.2016	29.01.2016
03.08	PLC & SCADA Based Industrial Automation using AB PLC	02	08.06.2015	19.06.2015
			14.09.2015	25.09.2015
			14.12.2015	24.12.2015
			01.02.2016	12.02.2016
03.09	Basic Industrial Instrumentation & Automation	02	06.04.2015	17.04.2015
			20.07.2015	31.07.2015
			02.11.2015	13.11.2015
			14.03.2016	24.03.2016

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 to other 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 focused and 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 and cooperation.

• 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.

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 $\nabla\left(\frac{1}{r}\right)$ 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. $m_1m_2=0$
2. $m_1m_2=-\pi$
3. $m_1m_2=\frac{-\pi}{2}$
4. $m_1m_2=-1$

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 $f(z)=P(r,\theta)+iQ(r,\theta)$ 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

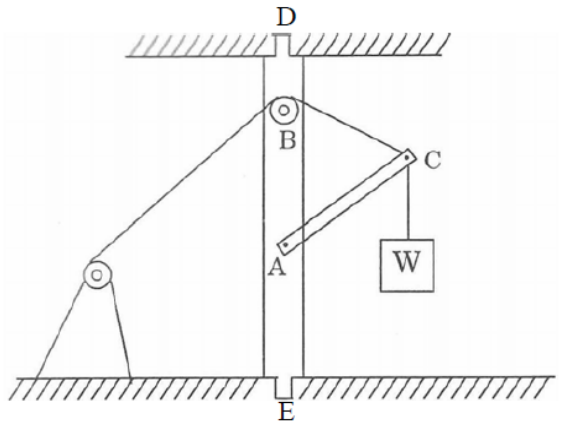
28. A discrete random variable X takes the values $a, ar, ar^2, \cdots, ar^{n-1}$ with equal probability. Then Arithmetic Mean (A.M) is

1. $a(1-r^n)$
2. $\frac{1}{n}a(1-r^n)$
3. $\frac{a}{n}\frac{(1-r^n)}{1-r}$
4. $\frac{a}{n}\frac{(r^n-1)}{1-r}$

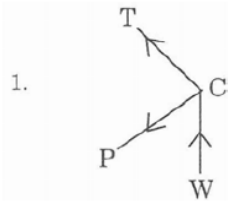
PART 02 — BASIC ENGINEERING AND SCIENCE

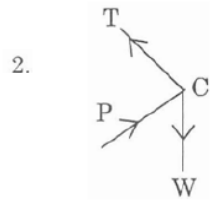
(Common to all candidates)

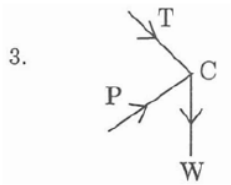
31. Free body diagram of point C of the Derrick shown below is

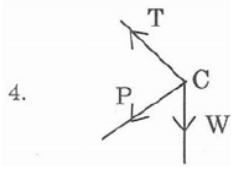


Derrick

1. 

2. 

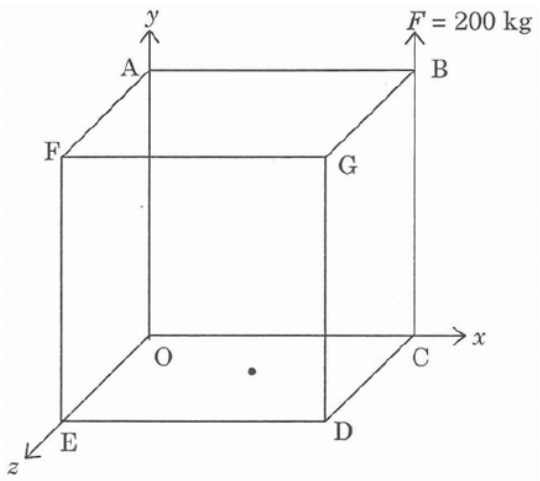
3. 

4. 

32. A 200 kg block is in contact with a plane inclined a t *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/sec2 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 1 0 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

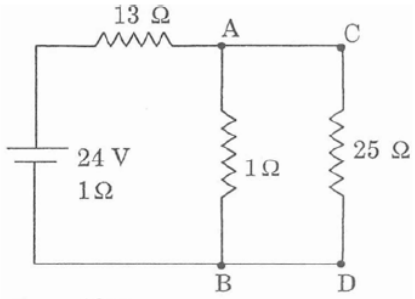
45. According to the United States Bureau of soil classification, the soil is designated as 'coarse clay' if the particle size varies from

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, i t must be remembered that the resistance of each arm of the star is given by the of the resistance of the two delta sides t h a t meet a t its ends divided by the resistances." of the three delta

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. Brazil
3. Mechanical bonding
4. Soldering

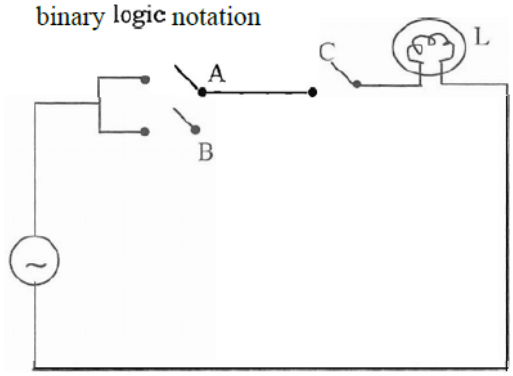
54. Under isobaric conditions, the Gibb's phase rule takes the form

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. $L = (A\,C + BC)$
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 $\overline{(x + yz)'}$

1. $\overline{(x' + y')} \cdot \overline{z'}$
2. $\overline{(x' + z')} \cdot y'$
3. $\overline{(y' + x') + z'}$
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

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 $\vec{a}$ and $\vec{b}$ such that $|\vec{a} \times \vec{b}| = \sqrt{10}$ and $\vec{a} \cdot \vec{b} = \sqrt{30}$, 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 $a = \sqrt{2i}$, 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

$$\mathbf{A} = \begin{vmatrix} \alpha^2 & a^3 & \alpha^4 \\ \alpha^3 & a^4 & \alpha^5 \\ a^4 & \alpha^6 & \alpha^7 \end{vmatrix}$$

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 a t 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 a t

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

(Answer ALL questions)

76. How much energy is stored by a 100 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

2. $B - N - 1$
4. $(B+N)-1$

78. 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 has generated 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. 290V

82. In a generator in case the resistance of the field winding is increased then output voltage will

1. increase
2. decrease
3. remain unaffected
4. fluctuate

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 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 resistor is replaced by 10 resistor the current in this branch will be

1.
2. 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

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. Kirchoff's 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, dildt 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 input voltage
2. ac output input voltage
3. dc output input voltage
4. ac output voltageldc input voltage

100. A 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

   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 use was

1. Mark–I
2. ENIAC
3.
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
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

LVDT

E-Pick off

Synchro

Select the correct answer using the codes given below :

1. and (d)
2. (a) and
3. and (d)
4. and

109. The most suitable thermocouple to be used for measuring temperature in the range of C to 1500" C is

1. Chromel–Constantan
2. Iron–Constantan
3.
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 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 transmission
4. both (1) and

114. In FM transmission, amplitude of the modulating signal determines

1. rate of frequency variations
amount of frequency shift
3. total balance of transmission
4. distance of broadcast

115. The highest harmonic generated in human voice is

1 kHz
2.
3. 3kHz
4.

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 used for TV broadcasting in the UHF band is

1. turnstile antenna
dipole antenna
3. antenna
4. antenna

118. Generally the aircraft electrical system uses supply frequency of

1.
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

ANNA UNIVERSITY : CHENNAI 600 025

OFFICE OF THE ADDITIONAL CONTROLLER OF EXAMINATIONS

(UNIVERSITY DEPARTMENTS)

GUIDELINES FOR AWARDING PUNISHMENTS TO MALPRACTICE CASES OF STUDENTS

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	I. - 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.	
4.	Any special marking in the answer script by the candidate.	
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 either possessing the question paper of another candidate or passing his question paper to another candidate with the question paper containing no additional writing on it.	
8.	The candidate possessing cell phones/programmable calculator(s)/any other electronic storage device(s) containing no incriminating materials.	II. - Fine of Rs.2000/- per subject.
9.	The candidate facilitating the other candidate(s) to copy from his/her answer script.	IIIA. – Invalidating the examination of the particular subject written by the candidate.
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.	IIIA, IIIB or IIIC IIIA – If the quantum of the incriminating material is less than that could normally be printed in two lines of A5 size paper, then punishment is restricted to the subject concerned only. IIIB – If the quantum is equal to or more than that could normally be printed in two lines and less than that could normally be printed in the full page of the A5 size paper then the punishment is invalidating the examination of the subject concerned and further the candidate is not considered for any moderation and revaluation in the current semester for any subject (including arrear subjects) IIIC – When the quantum is equal to or more than that could normally be printed in full page of A5 size paper, then the punishment would be 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 arrear subjects. If the candidate has registered for the arrear subjects only, invalidating the examinations of all the arrear-subjects registered by the candidate. The punishment does not include project work and the subjects with 100% internal evaluation.
11.	The candidate possessing cell phone(s)/programmable calculator(s)/any other electronic storage device(s) and containing incriminating materials (whether used or not)	
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.	

Contd 2..

Sl.No.	Nature of Malpractice	Maximum Punishment
16.	Vulgar/offensive writings by the candidate in the answer script.	IV. – Invalidating the examinations of all the theory and practical subjects of the current semester and all the arrears subjects registered by the candidate.
17.	The candidate possessing the answer script of another candidate.	
18.	The candidate passing his/her answer script to another candidate.	
19.	Appeal by the candidate in the answer script coupled with a promise of any form of consideration.	
20.	The candidate misbehaving in the examination hall.	Va. – For candidates who have not completed the programme: The examinations of all the theory and the practical subjects of the current semester and all the arrear subjects registered by the candidate are invalidated. Further, the candidate 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 arrear subjects upto the last semester during the debarred period. Vb. – For candidates who have completed the programme: The examinations of all the arrear subjects registered by the candidate are invalidated. Further, the candidate is prevented from writing the examinations of the arrear subjects for the two subsequent semesters.
21	Involved in any one or more of the malpractices of serial no.10 to 19 for the second or subsequent times.	
22.	Cases of Impersonation.	For both the impersonator and the bonafide student for whom the impersonation was done. VI. – The examinations of all the subjects registered by the candidate are invalidated and further the student is debarred from continuing his/her studies and debarred from writing the examinations permanently. He/She is not eligible for any further admission to any programme of the University.

Additional Controller of Examinations
University Departments

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**

TO Date

The Principal

KLNCE

Pottapalayam

Sub: Requisition for Bonafide Certificate

****

Dear Sir,

Kindly issue Bonafide Certificate to me

Purpose :

Venue :

Name :

Father's Name :

Roll No. :

Department :

Year & Sem :

Thanking You,

Yours Sincerely

Date :

Station :

Recommended by :

Received :