K.L.N. COLLEGE OF ENGINEERING

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

(Approved by AICTE, New Delhi, Recognized Research center, and permanently affiliated to Anna University, Chennai)
(Three times Accredited by NBA, New Delhi)
B.E. – EEE – II – Semester - Students Hand book – EVEN Semester of 2016 – 2017

This Hand 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, Blooms Taxonomy.
3. Engineering Ethics.
4. Academic Calendar – 2016 – 2017 (Even semester).
5. Class Time Table.
6. B.E. – EEE – Syllabus – II Semester.
7. Lecture Schedule, Tutorial, Assignment questions, Seminar, Self-study topics (CT).
8. Anna University question papers (Previous years).
9. Reminders on Placement and Career Guidance.
10. General Reminders
11. All India Installed capacity (in MW) of power stations.
12. Skill Development and Entrepreneurship Programmes-Schedule- Advanced Training Institute – Guindy Industrial Estate-Chennai.

- Continued in the Back Cover Page

13. List of PSUs through GATE Exams.

14. Selected software companies and their profiles

15. Selected Core companies and their profiles

16. Aptitude Mock test papers & answers.

17. Mock E-mail writing questions

18. GATE 2016 - Questions & Answers.

19. General tips for effective communication and Leadership skills.

20. Malpractices & Punishments in Anna University Examination

21. 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) Program 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.

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

Ref:KLNCE/Academic Calendar/ II SEM 2016 - 2017/ **Date: 28.12.2016**

ACADEMIC CALENDAR: 2016-2017 Second Semester - B.E./B.Tech Courses

	January - 2017			**February – 2017**			**March – 2017**			**April – 2017**		
Day	Dt		**W.D**	Dt		**W.D**	Dt		**W.D**	Dt		**W.D**
Sun	1	**NEW YEAR - Founders Day – HOLIDAY**			Holiday			Holiday			Holiday	
Mon	2	**Commencement of I Yr. B.E/B.Tech classes**	**1**								----------	
Tue	3	Class Committee Meeting - I (3.1.17 - 6.1.17)	**2**									
Wed	4		**3**	1	Class Committee Meeting - II (1.2.17 - 3.2.17)	**22**	1	Class Committee Meeting - III (1.3.17 - 3.3.17)	**44**			
Thu	5		**4**	2		**23**	2		**45**			
Fri	6	Department Faculty Meeting - I	**5**	3	Department Faculty Meeting - II	**24**	3	Annual Sports Day - Tentative	**46**			
Sat	7	Holiday		4	Holiday		4	Holiday		1	Holiday	
Sun	8	Holiday		5	Holiday		5	Holiday		2	Holiday	
Mon	9		**6**	6	CIT - I Review Meeting	**25**	6	Department Faculty Meeting - III	**47**	3	Class Committee Meeting - IV (3.4.17 - 7.4.17) CIT - IV Review Meeting	**68**
Tue	10		**7**	7		**26**	7		**48**	4		**69**
Wed	11		**8**	8		**27**	8		**49**	5	End of Unit V	**70**
Thu	12		**9**	9	End of Unit - II	**28**	9		**50**	6		**71**
Fri	13		**10**	10	**CIT - II (10.2.2017 - 16.2.2017)**	**29**	10		**51**	7	Department Faculty Meeting - IV **CIT V/Model Exam (7.4.2017 - 13.4.2017)**	**72**
Sat	14	**Pongal - Holiday**		11	**Thursday Order**	**30**	11	19th Graduation Day - Tentative **Wednesday Order**	**52**	8	23rd College Annual Day - Tentative - **Tuesday Order**	**73**
Sun	15	**Thiruvalluar thinam - Holiday**		12	Holiday		12	Holiday		9	**Mahaveer Jeyanthi - Holiday**	
Mon	16	**Ulavar Thirunaal - Holiday**		13		**31**	13	CIT - III Review Meeting	**53**	10	AU Practical Exam Slot I - Tentative	74
Tue	17		**11**	14		**32**	14		**54**	11		75
Wed	18		**12**	15		**33**	15		**55**	12		76
Thu	19		**13**	16		**34**	16	End of Unit IV	**56**	13		77
Fri	20	End of Unit - I	**14**	17		35	17		**57**	14	**Tamil Putthandu / Good Friday & Dr.Ambedkar Birthday - Holiday**	
Sat	21	Holiday		18	Holiday		18	Holiday		15	Holiday	
Sun	22	Holiday		19	Holiday		19	Holiday		16	Holiday	
Mon	23	**CIT - I (23.1.2017 - 30.1.2017)**	**15**	20		**36**	20	**CIT IV (20.3.2017 - 25.3.2017)**	**58**	17	AU Practical Exam Slot II - Tentative	78
Tue	24		**16**	21		**37**	21		**59**	18		79
Wed	25		**17**	22		**38**	22		**60**	19		80
Thu	26	**Republic day - Holiday**		23	CIT - II Review Meeting	**39**	23		**61**	20		81
Fri	27		**18**	24		**40**	24		**62**	21		82
Sat	28	**Monday Order**	**19**	25	**Tuesday Order**	41	25	Friday Order	**63**	22	**Monday Order**	83
Sun	29	Holiday		26	Holiday		26	Holiday		23	Holiday	
Mon	30		**20**	27	End of Unit III	**42**	27		**64**	24	Last Working Day	84
Tue	31		**21**	28	**CIT - III (28.2.2017 - 7.3.2017)**	**43**	28		**65**	25		
Wed							29	**Telugu New Year - Holiday**		26		
Thu							30		**66**	27	Commenencement of Anna University Theory Examination	
Fri							31		**67**	28		
Sat										29		
Sun										30		

Note: Model practical examination & remedial test if any may be conducted according to subject handler's convenience

Commencement of III Semester classes: 26.06.2017 (Monday)

Cc to All HODs, Directors, E.O (S & PR), E.O (Admin & HR), Librarian (UG/PG), ISSG, TPO, PD, SM, DM, Student section

PRINCIPAL

Date: 21.12.2016

ANNA UNIVERSITY: : CHENNAI – 600 025

ACADEMIC SCHEDULE

for the

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

ACADEMIC YEAR 2016 – 2017

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

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

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

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

NOTE:

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

DIRECTOR
ACADEMIC COURSES

DAC - SB

Year/Sem/Sec : I / II / A **Faculty In-charge : Dr. S.Parthasarathy**

TIME→ DAY↓	09.00 – 09.50	09.50 – 10.40	10.55- 11.45	11.45- 12.35	*L U N C H*	01.15- 02.05	02.05- 02.55	02.55- 03.45	04.00- 05.00
PERIOD→	**I**	**II**	**III**	**IV**		**V**	**VI**	**VII**	**VIII**
MON	ENG	MATHS	CT	BCME		PHY LAB / CHE LAB			-
TUE	CHE	ENG	PHY	CT		CT	MATHS	BCME	PHY/MATHS
WED	MATHS	CHE	BCME	PHY		EC LAB			CT
THU	BCME	CT	CT	CHE		MATHS	PHY	ENG	BCME/CHE
FRI	PHY	CHE	ENG	MATHS		CP LAB			-

Year/Sem/Sec : I / II / B **Faculty In-charge : S. Rajalingam**

TIME→ DAY↓	09.00 – 09.50	09.50 – 10.40	10.55- 11.45	11.45- 12.35	*L U N C H*	01.15- 02.05	02.05- 02.55	02.55- 03.45	04.00- 05.00
PERIOD→	**I**	**II**	**III**	**IV**		**V**	**VI**	**VII**	**VIII**
MON	CHE	BCME	MATHS	ENG		PHY LAB / CHE LAB			
TUE	PHY	CHE	CT	MATHS		EC LAB			CT
WED	ENG	MATHS	CHE	BCME		CT	CT	PHY	PHY/CHE
THU	MATHS	CP LAB				ENG	PHY	BCME	BCME/MATHS
FRI	CT	CT	PHY	BCME		MATHS	CHE	ENG	

SUB CODE	SUBJECT NAME		STAFF NAME	
			Section - A	Section - B
HS6251	Technical English – II	ENG	T. Sivapriya	P. Pandia Rajammal
MA6251	Mathematics – II	MATHS	G. Sitalakshmi	P.Shiny Jasintha
PH6251	Engineering Physics - II	PHY	K. Poovendran	V.Revathy
CY6251	Engineering Chemistry - II	CHE	E. Rajalakshmi	K. Ayyampandi
GE6251	Basic Civil and Mechanical Engineering	BCME	R.Manikandan	M. Satheeshkumar
EE6201	Circuit Theory	CT	Dr. S. Parthasarathy	S. Rajalingam
GE6262	Physics and Chemistry Laboratory - II	PHY LAB	K. Poovendran	V.Revathy
		CHE LAB	E. Rajalakshmi	Ayyampandi
GE6263	Computer Programming Laboratory	CP LAB	M.S.C. Sujitha	R. Divya
EE6211	Electric Circuits Laboratory	EC LAB	Dr. S. Parthasarathy	S. Rajalingam

ANNA UNIVERSITY, CHENNAI

AFFILIATED INSTITUTIONS

R - 2013

B. E. ELECTRICAL AND ELECTRONICS ENGINEERING

I TO VIII SEMESTERS CURRICULUM AND SYLLABUS

SEMESTER I

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	HS6151	Technical English - I	3	1	0	4
2.	MA6151	Mathematics - I	3	1	0	4
3.	PH6151	Engineering Physics - I	3	0	0	3
4.	CY6151	Engineering Chemistry - I	3	0	0	3
5.	GE6151	Computer Programming	3	0	0	3
6.	GE6152	Engineering Graphics	2	0	3	4
PRACTICAL						
7.	GE6161	Computer Practices Laboratory	0	0	3	2
8.	GE6162	Engineering Practices Laboratory	0	0	3	2
9.	GE6163	Physics and Chemistry Laboratory - I	0	0	2	1
			17	**2**	**11**	**26**

SEMESTER II

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	HS6251	Technical English - II	3	1	0	4
2.	MA6251	Mathematics - II	3	1	0	4
3.	PH6251	Engineering Physics - II	3	0	0	3
4.	CY6251	Engineering Chemistry - II	3	0	0	3
5.	GE6251	Basic Civil and Mechanical Engineering	4	0	0	4
6.	EE6201	Circuit Theory	3	1	0	4
PRACTICAL						
7.	GE6262	Physics and Chemistry Laboratory - II	0	0	2	1
8.	GE6263	Computer Programming Laboratory	0	1	2	2
9.	EE6211	Electric Circuits Laboratory	0	0	3	2
		TOTAL	**19**	**4**	**7**	**27**

1. Iodine flask - 30 Nos
2. pH meter - 5 Nos
3. Conductivity meter - 5 Nos
4. Spectrophotometer - 5 Nos
5. Ostwald Viscometer - 10 Nos

Common Apparatus : Pipette, Burette, conical flask, percelain tile, dropper (each 30 Nos.)

HS6251 TECHNICAL ENGLISH II L T P C
3 1 0 4

OBJECTIVES:

- To make learners acquire listening and speaking skills in both formal and informal contexts.
- To help them develop their reading skills by familiarizing them with different types of reading strategies.
- To equip them with writing skills needed for academic as well as workplace contexts.
- To make them acquire language skills at their own pace by using e-materials and language lab components.

UNIT I 9+3

Listening - Listening to informal conversations and participating; Speaking - Opening a conversation (greetings, comments on topics like weather) - Turn taking - Closing a conversation (excuses, general wish, positive comment, thanks); Reading - Developing analytical skills, Deductive and inductive reasoning - Extensive reading; Writing - Effective use of SMS for sending short notes and messages - Using 'emoticons' as symbols in email messages; Grammar - Regular and irregular verbs - Active and passive voice; Vocabulary - Homonyms (e.g. 'can') - Homophones (e.g. 'some', 'sum'); E-materials - Interactive exercise on Grammar and vocabulary – blogging; Language Lab - Listening to different types of conversation and answering questions.

UNIT II 9+3

Listening - Listening to situation based dialogues; Speaking - Conversation practice in real life situations, asking for directions (using polite expressions), giving directions (using imperative sentences), Purchasing goods from a shop, Discussing various aspects of a film (they have already seen) or a book (they have already read); Reading - Reading a short story or an article from newspaper, Critical reading, Comprehension skills; Writing - Writing a review / summary of a story / article, Personal letter (Inviting your friend to a function, congratulating someone for his / her success, thanking one's friends / relatives); Grammar - modal verbs, Purpose expressions; Vocabulary - Phrasal verbs and their meanings, Using phrasal verbs in sentences; E-materials - Interactive exercises on Grammar and vocabulary, Extensive reading activity (reading stories / novels), Posting reviews in blogs - Language Lab - Dialogues (Fill up exercises), Recording students' dialogues.

UNIT III 9+3

Listening - Listening to the conversation - Understanding the structure of conversations; Speaking - Conversation skills with a sense of stress, intonation, pronunciation and meaning - Seeking information – expressing feelings (affection, anger, regret, etc.); Reading - Speed reading – reading passages with time limit - Skimming; Writing - Minutes of meeting – format and practice in the preparation of minutes - Writing summary after reading articles from journals - Format for journal articles – elements of technical articles (abstract, introduction, methodology, results, discussion, conclusion, appendices, references) - Writing strategies; Grammar - Conditional clauses - Cause and effect expressions; Vocabulary - Words used as nouns and verbs without any change in the spelling (e.g. 'rock', 'train', 'ring'); E-materials - Interactive exercise on Grammar and vocabulary -

Speed Reading practice exercises; Language Lab - Intonation practice using EFLU and RIE materials – Attending a meeting and writing minutes.

UNIT IV **9+3**

Listening - Listening to a telephone conversation, Viewing model interviews (face-to-face, telephonic and video conferencing); Speaking - Role play practice in telephone skills - listening and responding, -asking questions, -note taking – passing on messages, Role play and mock interview for grasping interview skills; Reading - Reading the job advertisements and the profile of the company concerned – scanning; Writing - Applying for a job – cover letter - résumé preparation – vision, mission and goals of the candidate; Grammar - Numerical expressions - Connectives (discourse markers); Vocabulary - Idioms and their meanings – using idioms in sentences; E-materials - Interactive exercises on Grammar and Vocabulary - Different forms of résumés- Filling up a résumé / cover letter; Language Lab - Telephonic interview – recording the responses - e-résumé writing.

UNIT V **9+3**

Listening - Viewing a model group discussion and reviewing the performance of each participant - Identifying the characteristics of a good listener; Speaking - Group discussion skills – initiating the discussion – exchanging suggestions and proposals – expressing dissent/agreement – assertiveness in expressing opinions – mind mapping technique; Reading - Note making skills – making notes from books, or any form of written materials - Intensive reading; Writing – Checklist - Types of reports – Feasibility / Project report – report format – recommendations / suggestions – interpretation of data (using charts for effective presentation); Grammar - Use of clauses; Vocabulary – Collocation; E-materials - Interactive grammar and vocabulary exercises - Sample GD - Pictures for discussion, Interactive grammar and vocabulary exercises; Language Lab - Different models of group discussion.

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

OUTCOMES:

Learners should be able to

- speak convincingly, express their opinions clearly, initiate a discussion, negotiate, argue using appropriate communicative strategies.
- write effectively and persuasively and produce different types of writing such as narration, description, exposition and argument as well as creative, critical, analytical and evaluative writing.
- read different genres of texts, infer implied meanings and critically analyse and evaluate them for ideas as well as for method of presentation.
- listen/view and comprehend different spoken excerpts critically and infer unspoken and implied meanings.

TEXTBOOKS:

1. Department of English, Anna University. Mindscapes: English for Technologists and Engineers. Orient Blackswan, Chennai. 2012
2. Dhanavel, S.P. English and Communication Skills for Students of Science and Engineering. Orient Blackswan, Chennai. 2011

REFERENCES:

1. Anderson, Paul V. Technical Communication: A Reader-Centered Approach. Cengage. New Delhi. 2008.
2. Muralikrishna, & Sunita Mishra. Communication Skills for Engineers. Pearson, New Delhi. 2011.
3. Riordan, Daniel. G. Technical Communication. Cengage Learning, New Delhi. 2005
4. Sharma, Sangeetha & Binod Mishra. Communication Skills for Engineers and Scientists. PHI Learning, New Delhi. 2009.

5. Smith-Worthington, Darlene & Sue Jefferson. Technical Writing for Success. Cengage, Mason USA. 2007.

EXTENSIVE Reading (Not for Examination)

1. Khera, Shiv. You can Win. Macmillan, Delhi. 1998.

Websites

1. http://www.englishclub.com
2. http://owl.english.purdue.edu

TEACHING METHODS:

- Lectures
- Activities conducted individually, in pairs and in groups like individual writing and presentations, group discussions, interviews, reporting, etc
- Long presentations using visual aids
- Listening and viewing activities with follow up activities like discussions, filling up worksheets, writing exercises (using language lab wherever necessary/possible) etc
- Projects like group reports, mock interviews etc using a combination of two or more of the language skills

EVALUATION PATTERN:

Internal assessment: 20%

3 tests of which two are pen and paper tests and the other is a combination of different modes of assessment like

- Project
- Assignment
- Report
- Creative writing, etc.

All the four skills are to be tested with equal weightage given to each.

- ✓ Speaking assessment: Individual presentations, Group discussions
- ✓ Reading assessment: Reading passages with comprehension questions graded following Bloom's taxonomy
- ✓ Writing assessment: Writing essays, CVs, reports etc. Writing should include grammar and vocabulary.
- ✓ Listening/Viewing assessment: Lectures, dialogues, film clippings with questions on verbal as well as audio/visual content graded following Bloom's taxonomy.

End Semester Examination: 80%

MA6251 **MATHEMATICS – II** **L T P C**
3 1 0 4

OBJECTIVES:

- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
- To acquaint the student with the concepts of vector calculus needed for problems in all engineering disciplines.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

UNIT I VECTOR CALCULUS 9+3

Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelopipeds.

UNIT II ORDINARY DIFFERENTIAL EQUATIONS 9+3

Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy's and Legendre's linear equations – Simultaneous first order linear equations with constant coefficients.

UNIT III LAPLACE TRANSFORM 9+3

Laplace transform – Sufficient condition for existence – Transform of elementary functions – Basic properties – Transforms of derivatives and integrals of functions - Derivatives and integrals of transforms - Transforms of unit step function and impulse functions – Transform of periodic functions. Inverse Laplace transform -Statement of Convolution theorem – Initial and final value theorems – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

UNIT IV ANALYTIC FUNCTIONS 9+3

Functions of a complex variable – Analytic functions: Necessary conditions – Cauchy-Riemann equations and sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping: $w = z+k$, kz, $1/z$, z^2, e^z and bilinear transformation.

UNIT V COMPLEX INTEGRATION 9+3

Complex integration – Statement and applications of Cauchy's integral theorem and Cauchy's integral formula – Taylor's and Laurent's series expansions – Singular points – Residues – Cauchy's residue theorem – Evaluation of real definite integrals as contour integrals around unit circle and semi-circle (excluding poles on the real axis).

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

OUTCOMES:

- The subject helps the students to develop the fundamentals and basic concepts in vector calculus, ODE, Laplace transform and complex functions. Students will be able to solve problems related to engineering applications by using these techniques.

TEXT BOOKS:

1. Bali N. P and Manish Goyal, "A Text book of Engineering Mathematics", Eighth Edition, Laxmi Publications Pvt Ltd.,2011.
2. Grewal. B.S, "Higher Engineering Mathematics", 41st Edition, Khanna Publications, Delhi, 2011.

REFERENCES:

1. Dass, H.K., and Er. Rajnish Verma," Higher Engineering Mathematics", S. Chand Private Ltd., 2011
2. Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2012.
3. Peter V. O'Neil," Advanced Engineering Mathematics", 7th Edition, Cengage learning, 2012.
4. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, 2008.
5. Sivarama Krishna Das P. and Rukmangadachari E., "Engineering Mathematics" Volume II, Second Edition, PEARSON Publishing, 2011.

PH6251 ENGINEERING PHYSICS – II L T P C
3 0 0 3

OBJECTIVES:

- To enrich the understanding of various types of materials and their applications in engineering and technology.

UNIT I CONDUCTING MATERIALS 9

Conductors – classical free electron theory of metals – Electrical and thermal conductivity – Wiedemann – Franz law – Lorentz number – Draw backs of classical theory – Quantum theory – Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states – carrier concentration in metals.

UNIT II SEMICONDUCTING MATERIALS 9

Intrinsic semiconductor – carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination – compound semiconductors -direct and indirect band gap- derivation of carrier concentration in n-type and p-type semiconductor – variation of Fermi level with temperature and impurity concentration –– Hall effect –Determination of Hall coefficient – Applications.

UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS 9

Origin of magnetic moment – Bohr magneton – comparison of Dia, Para and Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – antiferromagnetic materials – Ferrites and its applications

Superconductivity: properties – Type I and Type II superconductors – BCS theory of superconductivity(Qualitative) - High T_c superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation.

UNIT IV DIELECTRIC MATERIALS 9

Electrical susceptibility – dielectric constant – electronic, ionic, orientational and space charge polarization – frequency and temperature dependence of polarisation – internal field – Claussius –

Mosotti relation (derivation) – dielectric loss – dielectric breakdown – uses of dielectric materials (capacitor and transformer) – ferroelectricity and applications.

UNIT V ADVANCED ENGINEERING MATERIALS 9

Metallic glasses: preparation, properties and applications. Shape memory alloys (SMA): Characteristics, properties of NiTi alloy, application, Nanomaterials– Preparation -pulsed laser deposition – chemical vapour deposition – Applications – NLO materials –Birefringence- optical Kerr effect – Classification of Biomaterials and its applications

TOTAL: 45 PERIODS

OUTCOMES:

- The students will have the knowledge on physics of materials and that knowledge will be used by them in different engineering and technology applications.

TEXT BOOKS:

1. Arumugam M., Materials Science. Anuradha publishers, 2010
2. Pillai S.O., Solid State Physics. New Age International(P) Ltd., publishers, 2009

REFERENCES:

1. Palanisamy P.K. Materials Science. SCITECH Publishers, 2011.
2. Senthilkumar G. Engineering Physics II. VRB Publishers, 2011.
3. Mani P. Engineering Physics II. Dhanam Publications, 2011.
4. Marikani A. Engineering Physics. PHI Learning Pvt., India, 2009.

CY6251 ENGINEERING CHEMISTRY - II L T P C
3 0 0 3

OBJECTIVES:

- To make the students conversant with boiler feed water requirements, related problems and water treatment techniques.
- Principles of electrochemical reactions, redox reactions in corrosion of materials and methods for corrosion prevention and protection of materials.
- Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.
- Preparation, properties and applications of engineering materials.
- Types of fuels, calorific value calculations, manufacture of solid, liquid and gaseous fuels.

UNIT I WATER TECHNOLOGY 9

Introduction to boiler feed water-requirements-formation of deposits in steam boilers and heat exchangers- disadvantages (wastage of fuels, decrease in efficiency, boiler explosion) prevention of scale formation -softening of hard water -external treatment zeolite and demineralization - internal treatment- boiler compounds (phosphate, calgon, carbonate, colloidal) - caustic embrittlement -boiler corrosion-priming and foaming- desalination of brackish water –reverse osmosis.

UNIT II ELECTROCHEMISTRY AND CORROSION 9

Electrochemical cell - redox reaction, electrode potential- origin of electrode potential- oxidation potential- reduction potential, measurement and applications - electrochemical series and its significance - Nernst equation (derivation and problems). Corrosion- causes- factors- types- chemical, electrochemical corrosion (galvanic, differential aeration), corrosion control - material selection and design aspects - electrochemical protection – sacrificial anode method and impressed current cathodic method. Paints- constituents and function. Electroplating of Copper

and electroless plating of nickel.

UNIT III ENERGY SOURCES 9

Introduction- nuclear energy- nuclear fission- controlled nuclear fission- nuclear fusion- differences between nuclear fission and fusion- nuclear chain reactions- nuclear reactor power generator- classification of nuclear reactor- light water reactor- breeder reactor- solar energy conversion- solar cells- wind energy. Batteries and fuel cells:Types of batteries- alkaline battery- lead storage battery- nickel-cadmium battery- lithium battery- fuel cell H_2 -O_2 fuel cell- applications.

UNIT IV ENGINEERING MATERIALS 9

Abrasives: definition, classification or types, grinding wheel, abrasive paper and cloth. Refractories: definition, characteristics, classification, properties – refractoriness and RUL, dimensional stability, thermal spalling, thermal expansion, porosity; Manufacture of alumina, magnesite and silicon carbide, Portland cement- manufacture and properties - setting and hardening of cement, special cement- waterproof and white cement–properties and uses. Glass - manufacture, types, properties and uses.

UNIT V FUELS AND COMBUSTION 9

Fuel: Introduction- classification of fuels- calorific value- higher and lower calorific values- coal- analysis of coal (proximate and ultimate)- carbonization- manufacture of metallurgical coke (Otto Hoffmann method) - petroleum- manufacture of synthetic petrol (Bergius process)- knocking- octane number - diesel oil- cetane number - natural gas- compressed natural gas(CNG)- liquefied petroleum gases(LPG)- producer gas- water gas. Power alcohol and bio diesel. Combustion of fuels: introduction- theoretical calculation of calorific value- calculation of stoichiometry of fuel and air ratio- ignition temperature- explosive range - flue gas analysis (ORSAT Method).

TOTAL: 45 PERIODS

OUTCOMES:

- The knowledge gained on engineering materials, fuels, energy sources and water treatment techniques will facilitate better understanding of engineering processes and applications for further learning.

TEXT BOOKS:

1. Vairam S, Kalyani P and SubaRamesh.,“Engineering Chemistry”., Wiley India PvtLtd.,New Delhi., 2011.
2. DaraS.S,UmareS.S.“Engineering Chemistry”, S. Chand & Company Ltd., New Delhi , 2010.

REFERENCES:

1 Kannan P. and Ravikrishnan A., “Engineering Chemistry”, Sri Krishna Hi-tech Publishing Company Pvt. Ltd. Chennai, 2009.

2. AshimaSrivastava and Janhavi N N., “Concepts of Engineering Chemistry”, ACME Learning Private Limited., New Delhi., 2010.
3. RenuBapna and Renu Gupta., “Engineering Chemistry”, Macmillan India Publisher Ltd., 2010.

4 Pahari A and Chauhan B., “Engineering Chemistry”., Firewall Media., New Delhi., 2010.

GE6251 BASIC CIVIL AND MECHANICAL ENGINEERING L T P C
4 0 0 4

OBJECTIVES

- To impart basic knowledge on Civil and Mechanical Engineering.
- To explain the materials used for the construction of civilized structures.
- To make the understand the fundamentals of construction of structure.
- To explain the component of power plant units and detailed explanation to IC engines their working principles.
- To explain the R & AC system.

A – CIVIL ENGINEERING

UNIT I SURVEYING AND CIVIL ENGINEERING MATERIALS 15

Surveying: Objects – types – classification – principles – measurements of distances – angles – leveling – determination of areas – illustrative examples.

Civil Engineering Materials: Bricks – stones – sand – cement – concrete – steel sections.

UNIT II BUILDING COMPONENTS AND STRUCTURES 15

Foundations: Types, Bearing capacity – Requirement of good foundations.

Superstructure: Brick masonry – stone masonry – beams – columns – lintels – roofing – flooring – plastering – Mechanics – Internal and external forces – stress – strain – elasticity – Types of Bridges and Dams – Basics of Interior Design and Landscaping.

TOTAL: 30 PERIODS

B – MECHANICAL ENGINEERING

UNIT III POWER PLANT ENGINEERING 10

Introduction, Classification of Power Plants – Working principle of steam, Gas, Diesel, Hydro-electric and Nuclear Power plants – Merits and Demerits – Pumps and turbines – working principle of Reciprocating pumps (single acting and double acting) – Centrifugal Pump.

UNIT IV IC ENGINES 10

Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines – Boiler as a power plant.

UNIT V REFRIGERATION AND AIR CONDITIONING SYSTEM 10

Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system – Layout of typical domestic refrigerator – Window and Split type room Air conditioner.

TOTAL: 30 PERIODS

OUTCOMES:

- Ability to explain the usage of construction material and proper selection of construction materials.
- Ability to design building structures.
- Ability to identify the components use in power plant cycle.
- Ability to demonstrate working principles of petrol and diesel engine.
- Ability to explain the components of refrigeration and Air conditioning cycle.

TEXT BOOKS:

1. Shanmugam G and Palanichamy M S, “Basic Civil and Mechanical Engineering”, Tata McGraw Hill Publishing Co., New Delhi, 1996.

REFERENCES:

1. Ramamrutham S., “Basic Civil Engineering”, Dhanpat Rai Publishing Co. (P) Ltd. 1999.
2. Seetharaman S., “Basic Civil Engineering”, Anuradha Agencies, 2005.
3. Venugopal K. and Prahu Raja V., “Basic Mechanical Engineering”, Anuradha Publishers, Kumbakonam, 2000.
4. Shantha Kumar S R J., “Basic Mechanical Engineering”, Hi-tech Publications, Mayiladuthurai, 2000.

EE6201	CIRCUIT THEORY	L T P C 3 1 0 4

OBJECTIVES:

- To introduce electric circuits and its analysis
- To impart knowledge on solving circuits using network theorems
- To introduce the phenomenon of resonance in coupled circuits.
- To educate on obtaining the transient response of circuits.
- To Phasor diagrams and analysis of three phase circuits

UNIT I BASIC CIRCUITS ANALYSIS 12

Ohm’s Law – Kirchoffs laws – DC and AC Circuits – Resistors in series and parallel circuits – Mesh current and node voltage method of analysis for D.C and A.C. circuits – Phasor Diagram – Power, Power Factor and Energy.

UNIT II NETWORK REDUCTION AND NETWORK THEOREMS FOR DC AND AC CIRCUITS 12

Network reduction: voltage and current division, source transformation – star delta conversion. Thevenins and Novton & Theorem – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem.

UNIT III RESONANCE AND COUPLED CIRCUITS 12

Series and paralled resonance – their frequency response – Quality factor and Bandwidth - Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.

UNIT IV TRANSIENT RESPONSE FOR DC CIRCUITS 12

Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. with sinusoidal input – Characterization of two port networks in terms of Z,Y and h parameters.

UNIT V THREE PHASE CIRCUITS 12

Three phase balanced / unbalanced voltage sources – analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & un balanced – phasor diagram of voltages and currents – power and power factor measurements in three phase circuits.

TOTAL : 60 PERIODS

OUTCOMES:

- Ability analyse electrical circuits
- Ability to apply circuit theorems
- Ability to analyse AC and DC Circuits

TEXT BOOKS:

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", Tata McGraw Hill publishers, 6th edition, New Delhi, 2003.
2. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, Tata McGraw-Hill, New Delhi, 2001.

REFERENCES:

1. Paranjothi SR, "Electric Circuits Analysis," New Age International Ltd., New Delhi, 1996.
2. Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis", Tata McGraw Hill, 2007.
3. Chakrabati A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi, 1999.
4. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, 2003.

GE6262 PHYSICS AND CHEMISTRY LABORATORY – II L T P C
0 0 2 1

PHYSICS LABORATORY – II

OBJECTIVES:

- To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics and properties of matter.

LIST OF EXPERIMENTS
(Any FIVE Experiments)

1. Determination of Young's modulus by uniform bending method
2. Determination of band gap of a semiconductor
3. Determination of Coefficient of viscosity of a liquid –Poiseuille's method
4. Determination of Dispersive power of a prism - Spectrometer
5. Determination of thickness of a thin wire – Air wedge method
6. Determination of Rigidity modulus – Torsion pendulum

OUTCOMES:

- The students will have the ability to test materials by using their knowledge of applied physics principles in optics and properties of matter.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Traveling microscope, meter scale, Knife edge, weights
2. Band gap experimental set up
3. Burette, Capillary tube, rubber tube, stop clock, beaker and weighing balance
4. spectrometer, prism, sodium vapour lamp.
5. Air-wedge experimental set up.
6. Torsion pendulum set up.

(vernier Caliper, Screw gauge, reading lens are required for most of the experiments)

CHEMISTRY LABORATORY - II

OBJECTIVES:

- To make the student acquire practical skills in the wet chemical and instrumental methods for quantitative estimation of hardness, alkalinity, metal ion content, corrosion in metals and cement analysis.

LIST OF EXPERIMENTS
(Any FIVE Experiments)

1 Determination of alkalinity in water sample
2 Determination of total, temporary & permanent hardness of water by EDTA method
3 Estimation of copper content of the given solution by EDTA method
4 Estimation of iron content of the given solution using potentiometer
5 Estimation of sodium present in water using flame photometer
6 Corrosion experiment – weight loss method
7 Conductometric precipitation titration using $BaCl_2$ and Na_2SO_4
8 Determination of CaO in Cement.

TOTAL: 30 PERIODS

OUTCOMES:

- The students will be conversant with hands-on knowledge in the quantitative chemical analysis of water quality related parameters, corrosion measurement and cement analysis.

REFERENCES:

1. Daniel R. Palleros, “Experimental organic chemistry” John Wiley & Sons, Inc., New York, 2001.
2. Furniss B.S. Hannaford A.J, Smith P.W.G and Tatchel A.R., “Vogel’s Textbook of practical organic chemistry, LBS Singapore ,1994.
3. Jeffery G.H, Bassett J., Mendham J. and Denny R.C., “Vogel’s Text book of quantitative analysis chemical analysis”, ELBS 5th Edn. Longman, Singapore publishers, Singapore, 1996.
4. Kolthoff I.M. and Sandell E.B. et al. Quantitative chemical analysis, McMillan, Madras 1980

- **Laboratory classes on alternate weeks for Physics and Chemistry.**

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1.	Potentiometer	-	5 Nos
2.	Flame photo meter	-	5 Nos
3.	Weighing Balance	-	5 Nos
4.	Conductivity meter	-	5 Nos

Common Apparatus : Pipette, Burette, conical flask, percelain tile, dropper (30 Nos each)

GE6263 COMPUTER PROGRAMMING LABORATORY

L	T	P	C
0	1	2	2

OBJECTIVES:

The Students should be made to

- Be exposed to Unix shell commands
- Be familiar with an editor on Unix
- Learn to program in Shell script
- Learn to write C programme for Unix platform

LIST OF EXPERIMENTS

1. UNIX COMMANDS **15**

Study of Unix OS - Basic Shell Commands - Unix Editor

2. SHELL PROGRAMMING **15**

Simple Shell program - Conditional Statements - Testing and Loops

3. C PROGRAMMING ON UNIX **15**

Dynamic Storage Allocation-Pointers-Functions-File Handling

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course the students should be able to:

- Use Shell commands
- Design of Implement Unix shell scripts
- Write and execute C programs on Unix

HARDWARE / SOFTWARE REQUIREMENTS FOR A BATCH OF 30 STUDENTS

Hardware

- UNIX Clone Server
- 33 Nodes (thin client or PCs)
- Printer – 3 Nos.

Software

- OS – UNIX Clone (33 user license or License free Linux)
- Compiler - C

EE6211 **ELECTRIC CIRCUITS LABORATORY** **L T P C**
0 0 3 2

OBJECTIVES :

- To provide practical experience with simulation of electrical circuits and verifying circuit theorems.

LIST OF EXPERIMENTS

1. Experimental verification of Kirchhoff's voltage and current laws
2. Experimental verification of network theorems (Thevenin, Norton, Superposition and maximum power transfer Theorem).
3. Study of CRO and measurement of sinusoidal voltage, frequency and power factor.
4. Experiental determination of time constant of series R-C electric circuits.
5. Experimental determination of frequency response of RLC circuits.
6. Design and Simulation of series resonance circuit.
7. Design and Simulation of parallel resonant circuits.
8. Simulation of low pass and high pass passive filters.
9. Simulation of three phase balanced and unbalanced star, delta networks circuits.
10. Experimental determination of power in three phase circuits by two-watt meter method .
11. Calibration of single phase energy meter.
12. Determination of two port network parameters.

TOTAL: 45 PERIODS

OUTCOMES :

- Ability to understand and apply circuit theorems and concepts in engineering applications.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1 Regulated Power Supply: 0 – 15 V D.C - 10 Nos / Distributed Power Source.
2 Function Generator (1 MHz) - 10 Nos.
3 Single Phase Energy Meter - 1 No.
4 Oscilloscope (20 MHz) - 10 Nos.
5 Digital Storage Oscilloscope (20 MHz) – 1 No.
6 Circuit Simulation Software (5 Users) (Pspice / Matlab /other Equivalent software Package) with PC(5 Nos.) and Printer (1 No.)
7 AC/DC - Voltmeters (10 Nos.), Ammeters (10 Nos.) and Multi-meters (10 Nos.)
8 Single Phase Wattmeter – 3 Nos.
9 Decade Resistance Box, Decade Inductance Box, Decade Capacitance Box Each - 6 Nos.
10 Circuit Connection Boards - 10 Nos.

Necessary Quantities of Resistors, Inductors, Capacitors of various capacities (Quarter Watt to 10 Watt)

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

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

LECTURE SCHEDULE

Course/Branch : **B.E / EEE** Subject: **CIRCUIT THEORY** Duration: **Jan-Apr 2017**

Subject Code : **EE6201** Semester: **II** Section: **A&B** Regulation: **2013(AUC)**

Staff Handling: **Dr.S. PARTHASARATHY & Mr. S. RAJALINGAM**

AIM

To develop the fundamental tools of linear circuit analysis which will be useful to all Engineers and to learn the "alphabet" of circuits, including wires, resistors, capacitors, inductors, voltage and current sources.

OBJECTIVES

- To introduce electric circuits and its analysis
- To impart knowledge on solving circuits using network theorems
- To introduce the phenomenon of resonance in coupled circuits
- To educate on obtaining the transient response of circuits
- To draw phasor diagrams and analysis of three phase circuits

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

Course	Course Outcome	POs	PSOs
C115.1	Apply Kirchhoff's current & voltage law to simple circuits and solve Complex circuits using Mesh & Nodal Methods.	1, 2, 3, 4, 5	1
C115.2	Apply Network theorems to solve simple and complex linear circuits.	1, 2, 3, 4, 5	1
C115.3	Solve the Series and Parallel resonant circuit, analyze the performance of single & double tuned circuits.	1, 2, 3, 4, 5	1
C115.4	Develop the Transient response of RLC circuits using Laplace Transform, explain the characteristics of two port networks.	1, 2, 3, 4, 5	1
C115.5	Explain three phase balanced and unbalanced star, delta network.	1, 2, 3, 4, 5	1

Target Periods-60

S. No	Date	Period Number	Topics to be Covered	Book No [Page No]
UNIT I - BASIC CIRCUITS ANALYSIS				**Target Periods : 12**
1.			Introduction	-
2.			Ohm's law, Kirchoff's laws (KCL & KVL)	R4 (30-31), T1 (30-36)
3.			Tutorial 1	-
4.			DC Circuits	R4(2-23)
5.			AC Circuits	R4(370-402)
6.			Resistors in series & parallel circuits	T1 (43-49)
7.			Tutorial 2	-
8.			Mesh current method- DC & AC Circuit	R4(93-104)
9.			Node voltage method – AC & DC Circuit	R4(417-421)
10.			Phasor diagram	R4(52-72)
11.			Power, Power factor & Energy	R4(16-30)
12.			Tutorial 3	-
Assignment – 1				***CLASS TEST – I***
UNIT II – NETWORK REDUCTION & NETWORK THEOREMS FOR DC & AC CIRCUITS				**Target Periods : 12**
13.			Network reduction technique- Introduction	T1(49)
14.			Voltage & Current division rule	T1 (49-52)
15.			Source transformation	T1 (110-116)
16.			Star –delta conversion	T1 (127-129)

17.			Tutorial 1	-
18.			Thevenin's theorem	T1 (116-123)
19.			Norton's theorem	T1 (116-123)
20.			Tutorial 2	-
21.			Superposition theorem	R4(130-135)
22.			Maximum power transfer theorem	T1 (125-127)
23.			Reciprocity theorem	R2(112-113)
24.			Tutorial 3	-
25.			**Content Beyond Syllabus**: Computer aided analysis of electric circuits	
Assignment – 2				
CENTRALIZED INTERNAL TEST – I				
UNIT III - RESONANCE AND COUPLED CIRCUITS				**Target Periods : 12**
26.			Series and Parallel resonance	R2(277)(290)
27.			Frequency response of series resonance	R4(629-634)
28.			Frequency response of parallel resonance	R4(634-637)
29.			Quality factor and Bandwidth	R2(288)(293)
30.			Tutorial 1	-
31.			Self-inductance	R5(6.1)
32.			Mutual inductance	T2(402-404)
33.			Coefficient of coupling	R2(407-409)
34.			Tutorial 2	-
35.			Tuned circuits-Introduction	R2(420)
36.			Single tuned circuit-analysis	R2(420-423)
37.			Tutorial 3	-
Assignment – 3				***CLASS TEST – II***
UNIT IV - TRANSIENT RESPONSE FOR DC CIRCUITS				**Target Periods : 12+2**
38.			Transient response –Introduction	R2(473)
39.			Transient response of RL circuit for DC input	R2(474-477)
40.			Transient response of RC circuit for DC input	R2(478-480)
41.			Tutorial 1	-
42.			Transient response of RLC circuit for DC input	R2(480-483)
43.			Tutorial 2	R2(480-483)
44.			Transient response of RL circuit for AC input	-
45.			Transient response of RC circuit for AC input	R2(483-486)
46.			Transient response of RLC circuit for AC input	R2(486-489)
47.			Two port networks	R2(693-762)
48.			Analysis of Z,Y and h parameters	R2(693-762)
49.			Tutorial 3	-
50.			**Quiz I**	
51.			**Seminar I**	
CENTRALIZED INTERNAL TEST – II				
UNIT V - THREE PHASE CIRCUITS				**Target Periods : 12+2**
52.			Three phase balanced voltage sources	R4(505-508)
53.			Three phase unbalanced voltage sources	R4(525-528)
54.			Three phase three wire circuit with star load	R5(9.11)
55.			Three phase three wire circuit with delta load	R5(9.12)
56.			Three phase four wire circuit with star load	R2(352-353)
57.			Three phase four wire circuit with delta load	R2(352-353)
58.			Balanced phasor diagram of voltage & current	R2(344-349)
59.			Unbalanced phasor diagram of voltage & current	R2(349-354)
60.			Power and power factor measurements in three phase circuits	R5(9.46-9.61)
61.			Tutorial 1	-
62.			Tutorial 2	-
63.			Tutorial 3	-
64.			**Quiz II**	-
65.			**Seminar II**	-
CLASS TEST – III				

Books: Text/Reference

S. No		Title of the Book	Author	Publisher	Year
1.	**T1**	Engineering Circuits Analysis	William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin	Tata McGraw Hill publishers, 6th edition, New Delhi.	2003
2.	**T2**	Electric circuits	Joseph A. Edminister, Mahmood Nahri	Schaum's series, Tata McGraw-Hill, New Delhi.	2001
3.	**R1**	Electric Circuits Analysis	Paranjothi SR	New Age International Ltd., New Delhi.	1996
4.	**R2**	Circuits and Networks Analysis and Synthesis	Sudhakar A and Shyam Mohan SP	Tata McGraw Hill	2007
5.	**R3**	Circuits Theory (Analysis and synthesis)	Chakrabati A	Dhanpath Rai & Sons, New Delhi.	1999
6.	**R4**	Fundamentals of Electric Circuits	Charles K. Alexander, Mathew N.O. Sadik	Second Edition, McGraw Hill	2003
7.	**R5**	Engineering circuit analysis	Gnanavadivel. J, Senthilkumar. C, Maruthupandi. P	Anuratha publications, Chennai.	2012

NPTEL LECTURES

S. No	UNIT	Date[Period]	TOPIC	Ref / Link
1.	III	Sp.cl	Resonance	https://www.youtube.com/watch?v=6mC0xkXsFdw
2.	IV	Sp.cl	Two port Networks	https://www.youtube.com/watch?v=GasWAlIvvD8

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C115.1	3	2	1	1	1	-	-	-	-	-	-	-	2	-	-
C115.2	3	2	1	1	1	-	-	-	-	-	-	-	2	-	-
C115.3	3	2	1	1	1	-	-	-	-	-	-	-	2	-	-
C115.4	3	2	1	1	1	-	-	-	-	-	-	-	2	-	-
C115.5	3	2	1	1	1	-	-	-	-	-	-	-	2	-	-
C115	3	2	1	1	1	-	-	-	-	-	-	-	2	-	-

Content Beyond Syllabus Added (CBS)	POs strengthened/vacant filled	CO/Unit
Computer aided analysis of electric circuits	PO2, PO3, PO4, (Strengthened) PO5	C115.2 / II

STAFF INCHARGE **HOD/EEE**

K.L.N. COLLEGE OF ENGINEERING
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
EE6201 – CIRCUIT THEORY [C115]

Important Questions/Tutorials/Assignments/Seminar

1. Course Outcomes

Course	Course Outcome	POs	PSOs
C115.1	Apply Kirchhoff's current &voltage law to simple circuits and solve Complex circuits using Mesh & Nodal Methods.	1,2,3,4,5	1
C115.2	Apply Network theorems to solve simple and complex linear circuits.	1,2,3,4,5	1
C115.3	Solve the Series and Parallel resonant circuit, analyze the performance of single & double tuned circuits.	1,2,3,4,5	1
C115.4	Develop the Transient response of RLC circuits using Laplace Transform, explain the characteristics of two port networks.	1,2,3,4,5	1
C115.5	Explain three phase balanced and unbalanced star, delta network.	1,2,3,4,5	1

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
C115.1	3	2	1	1	1	-	-	-	-	-	-	-	2	-	-
C115.2	3	2	1	1	1	-	-	-	-	-	-	-	2	-	-
C115.3	3	2	1	1	1	-	-	-	-	-	-	-	2	-	-
C115.4	3	2	1	1	1	-	-	-	-	-	-	-	2	-	-
C115.5	3	2	1	1	1	-	-	-	-	-	-	-	2	-	-
C115	3	2	1	1	1	-	-	-	-	-	-	-	2	-	-

3. PROGRAM OUTCOMES (POs)

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

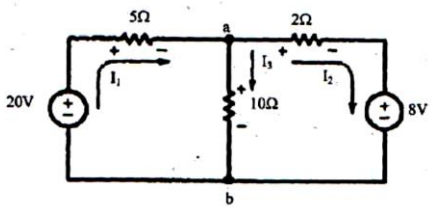
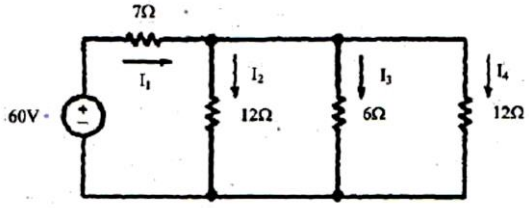
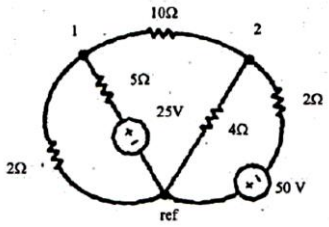
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

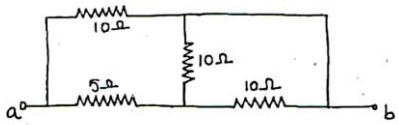
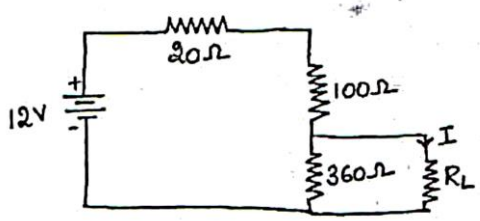
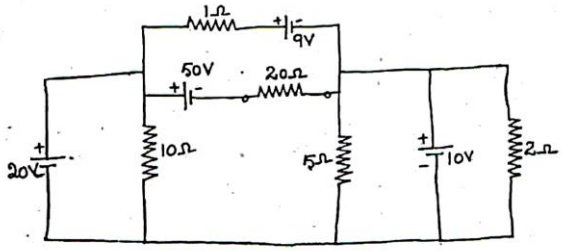
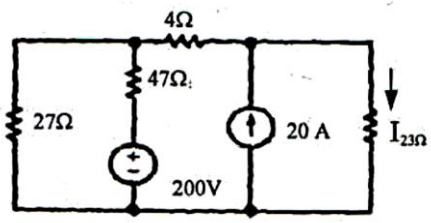
PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental

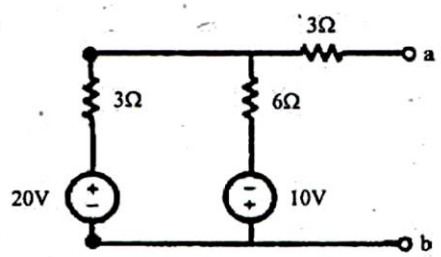
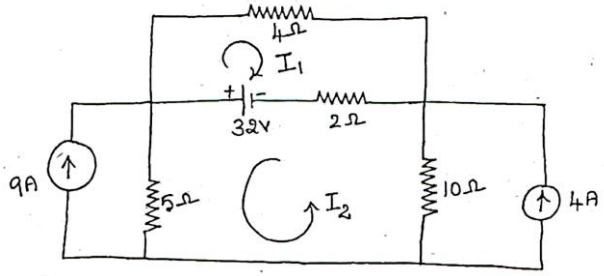
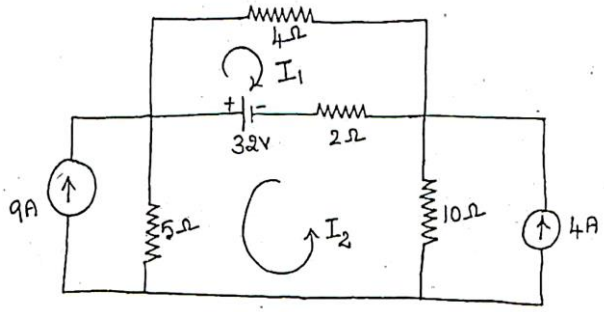
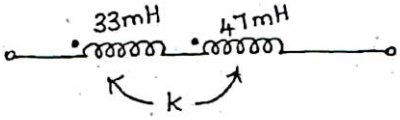
considerations.

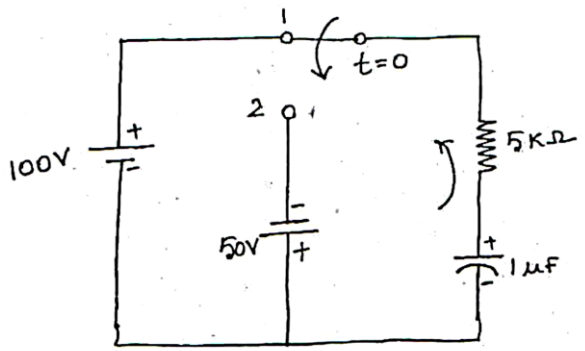
PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

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.

4. IMPORTANT QUESTIONS			
S. No.	**Questions**	**COs**	**POs**
1.1	Obtain the current in each branch of the network shown below using Kirchhoff's Current Law. 	C115.1	1,2
1.2	Use branch currents in the network shown below to find the current supplied by the 60-V Source. Solve the circuit by the mesh current method. (16) 	C115.1	1,2
1.3	Solve the network given below by the node voltage method. 	C115.1	1,2

1.4	Calculate the equivalent resistance between the terminals "*a*" and "*b*", in Fig. 1.  Fig. 1	C115.1	1,2
1.5	Calculate the value of I_N for the circuit shown in Fig. 2.  Fig. 2	C115.1	1,2
2.1	Find the current *I*, through the 20 Ω resistor shown in Fig. 7 using Thevenin's theorem. (16)  Fig. 7	C115.2	1,2
2.2	Compute the current in the 23 Ω resistor of the following figure shown below by applying the superposition principle. (8)  	C115.2	1,2

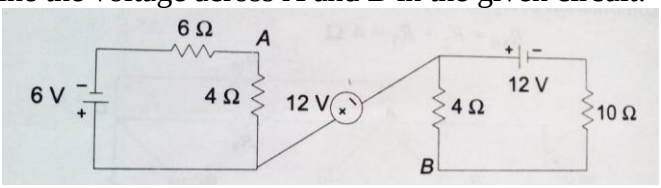
2.3	Obtain the Thevenin and Norton equivalent circuits for the active network shown below. (16) 	C115.2	1,2
2.4	**Find the current through 5 ohm resistor using superposition theorem** 	C115.2	1,2
2.5	**Find the current through 5 ohm resistor using Thevenins theorem and replace 5 ohm by 10 ohm and then find the current through 10 ohm resistor.** 	C115.2	1,2
3.1	Calculate the total inductance of the circuit, if the coefficient of coupling (k) between the two coils is 0.6, as shown in Fig. 3.  Fig. 3	C115.3	1,2
3.2	Impedance Z_1 and Z_2 are parallel and this combination is in series with an impedance Z_3, connected to a 100 V, 50 Hz ac supply. $Z_1 = (5 - jX_c)\Omega$, $Z_2 = (5 + j0)\Omega$, $Z_3 = (6.25 + j1.25)\Omega$. Determine the value of capacitance such that the total current of the circuit will be in phase with the total voltage. Find the circuit current and power. (16)	C115.3	1,2

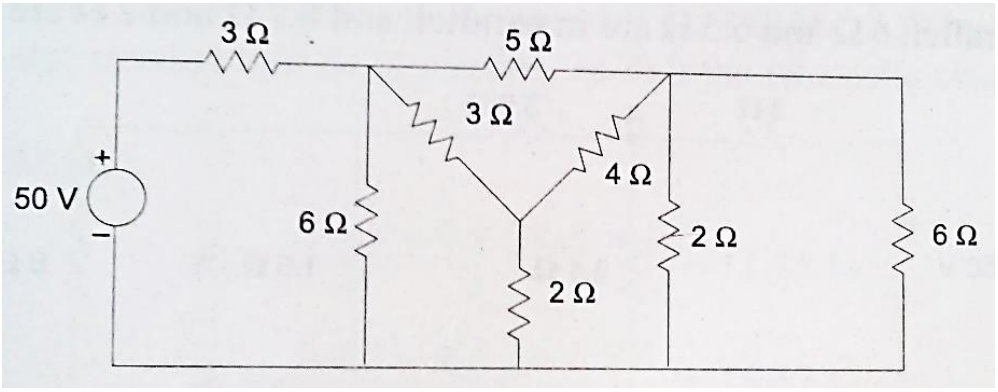
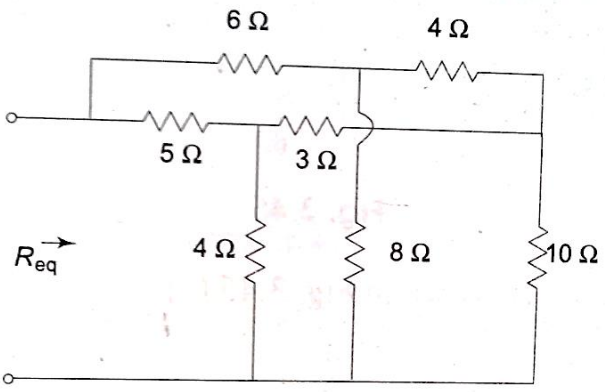
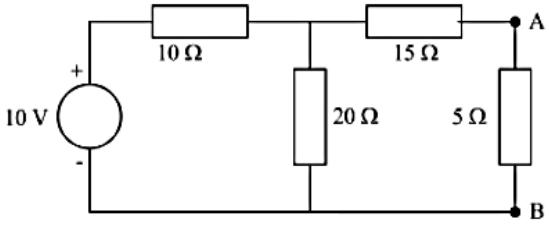
3.3	Derive the expression for mutual inductance & coefficient of coupling of the transformer.	C115.3	1,2
3.4	Derive the expression for resonant frequency, Band width, and quality factor of series resonant circuit.	C115.3	1,2
3.5	Derive the expression for resonant frequency, Band width, and quality factor of parallel resonant circuit.	C115.3	1,2
4.1	The switch in the circuit shown in Fig. 9 is moved from position 1 to 2 at $t = 0$. Find the expression for voltage across resistance and capacitor, energy in the capacitor for $t > 0$. (16) 	C115.4	1,2
4.2	Derive the expression for time constant in DC response of RL series circuit and analyze.	C115.4	1,2
4.3	Derive the expression for time constant in AC response of RL series circuit and analyze.	C115.4	1,2
4.4	Derive the expression for time constant in DCresponse of RLC series circuit and analyze.	C115.4	1,2
4.5	Characterize the two port networks in terms of Z,Y and h parameters.	C115.4	1,2
5.1	Show that three phase power can be measured by two wattmeters. Draw the phasor diagrams. Derive an expression for power factor interms of wattmeter readings. (16)	C115.5	1,2
5.2	A 400 V (line to line) is applied to three star connected identical impedances each consisting of a 4 Ω resistance in series with 3 Ω inductive reactance. Find (1) line current and (2) total power supplied. (8)	C115.5	1,2
5.3	Analyze the three phase three wire circuits with star connected balanced loads	C115.5	1,2
5.4	Draw and analyze the phasor diagram of voltages and currents of a three phase balanced circuits	C115.5	1,2

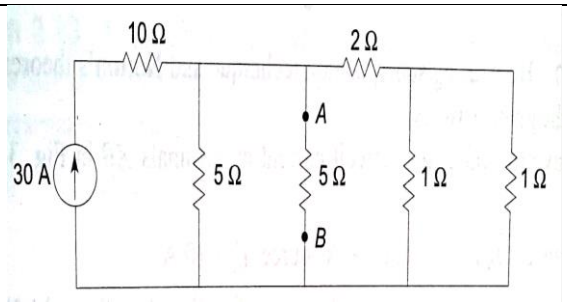
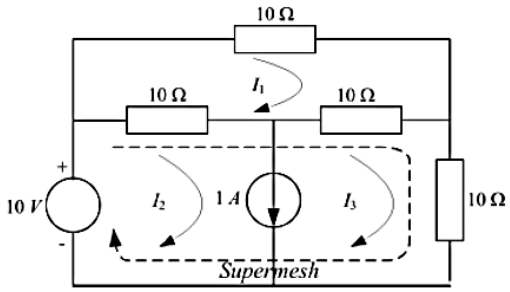
5.5	Three star-connected impedances $Z_1 = (20 + j37.7)\ \Omega$ per phase are in parallel with three delta-connected impedance $Z_2 = (30 - j159.3)\ \Omega$ per phase. The line voltage is 398 volts. Find the line current, power factor, power and reactive volt-ampere taken by the combination.	C115.5	1,2

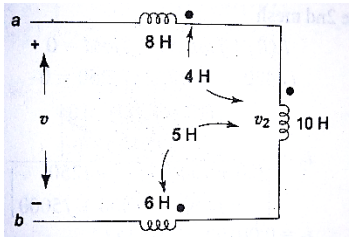
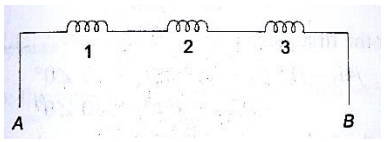
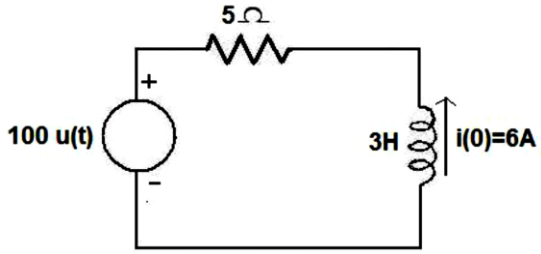
5.TUTORIAL QUESTIONS

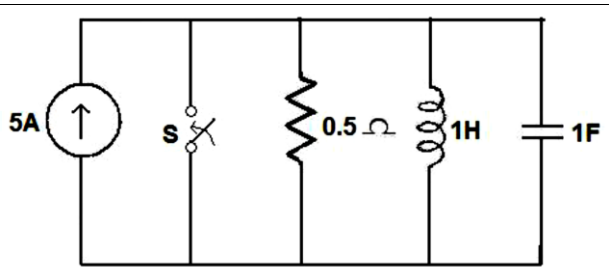
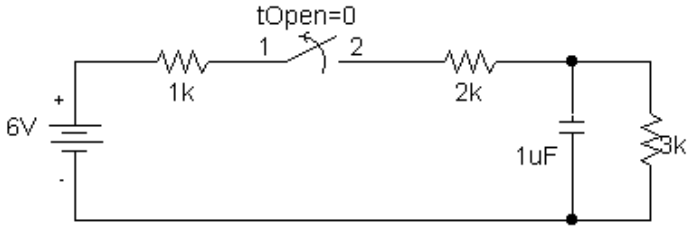
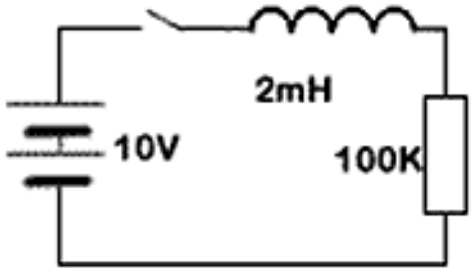
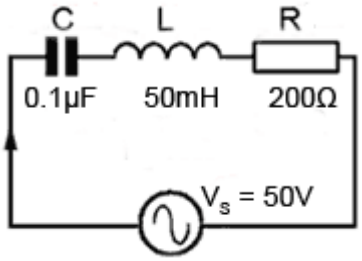
UNIT I - BASIC CIRCUITS ANALYSIS

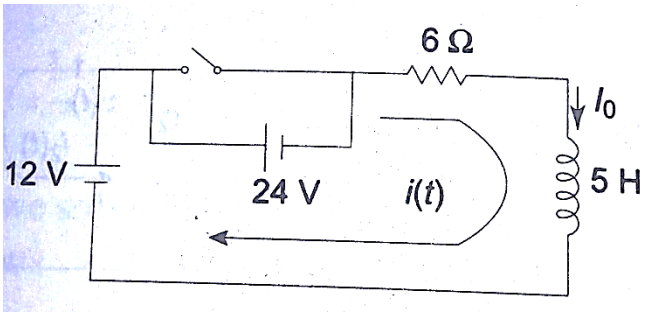
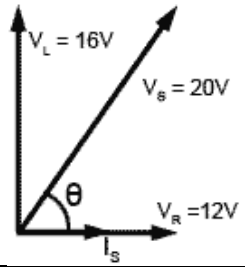
T.1.1	A Resistor with a current of 3A through it converts 500J of electrical energy to heat energy in 12s. Determinethe voltage across the resistor. **ANS: 13.88V**	C115.1	1,2,3
T.1.2	Determine the power rating of a 5 ohm resistor which has a voltage rating of 100V. **ANS: 2KW**	C115.1	1,2,3
T.1.3	Determine the inductance of the coil through which flows a current of 0.2A with energy of 0.15J. **ANS:7.5H**	C115.1	1,2,3
T.1.4	Determine the inductance of a coil in which a current increases linearly from 0 to 0.2A in 0.3s, producing a voltage of 15V. **ANS: 22.73H**	C115.1	1,2,3
T.1.5	How will you calculate the value of resistance in 3, 4 and 5 band resistors? Illustrate with examples.	C115.1	1,4
T.1.6	An AC voltage of 220V is applied to a pure inductance at 50Hz. If the current is 5A, determine the instantaneous voltage. **ANS: V=311sin314t V**	C115.1	1,2,3
T.1.7	In an AC circuit, containing pure inductance, the voltage applied is 110V, 50Hz while the current is 10A. Determine the value of inductance. **ANS: L=35mH**	C115.1	1,2,3
T.1.8	An inductor of 20mH offers a reactance of 100 ohm. Determine the supply frequency. **ANS: f=796Hz**	C115.1	1,2,3
T.1.9	Determine the voltage across A and B in the given circuit.  **ANS: Voltage=13.04V**	C115.1	1,2,3
T.1.10	When a dc voltage is applied to a capacitor, the voltage across its terminals is found to build up in accordance with $V_C = 50(1-e^{-100t})$. After a lapse of 0.01s, the current flow is equal to 2mA. Determine the value of capacitance in microfarads. **ANS: 1.089 microfarad**	C115.1	1,2,3

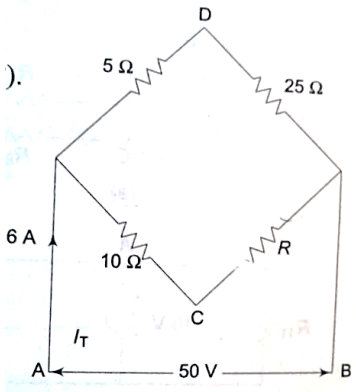
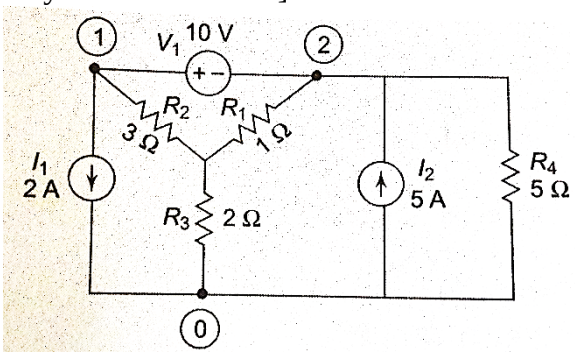
	UNIT II - NETWORK REDUCTION AND NETWORK THEOREMS FOR DCAND AC CIRCUITS		
T.2.1	Determine the current drawn by the given circuit.  **ANS: Current=10.2A**	C115.2	1,2,3
T.2.2	Determine the equivalent resistance by using star delta transformation.  **ANS: R_{eq}=4.93 ohm**	C115.2	1,2,3
T.2.3	Use Thevenin's theorem to determine the current through 5 ohm resistor.  **ANS: 0.25A**	C115.2	1,2,3
T.2.4	Determine the current through 5 ohm resistor by applying Norton's theorem.	C115.2	1,2,3

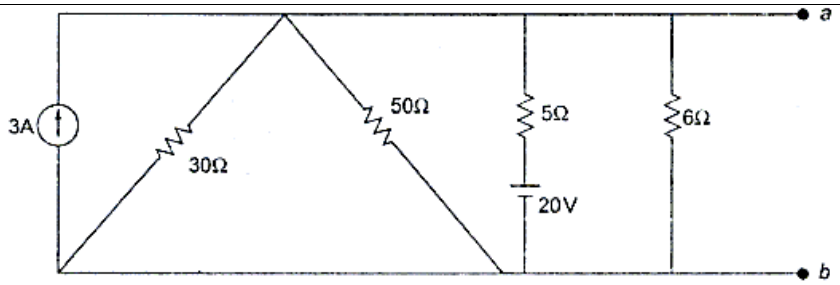
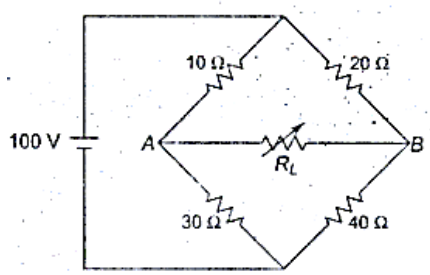
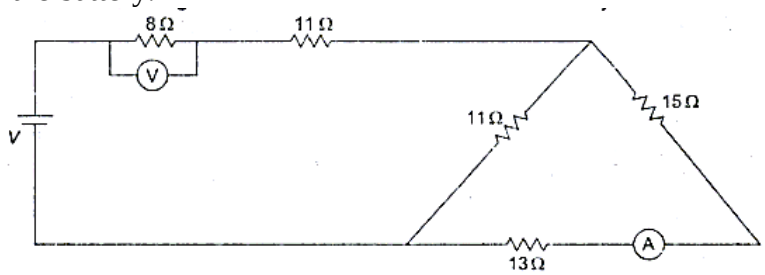
	 **ANS: 7.51A**		
T.2.5	Determine the current supplied by the 10V voltage source.  **ANS: I_2=1A**	C115.2	1,2,3
	UNIT III - RESONANCE AND COUPLED CIRCUITS		
T.3.1	A series RLC circuit has R=20 ohm, L=0.005 H and C=0.2 µF. It is fed from a 100 V variable frequency source. Calculate (a) frequency at which current is maximum (b) impedance at this frequency and (c) voltage across inductor at this frequency. **ANS: (a)f_r=5033Hz, (b) Z=R=20Ω, (c) V_L=230.55V**	C115.3	1,2,3
T.3.2	A series RLC circuit with R=10 ohms, L=10 mH and C=1µF has an applied voltage of 200 V at resonant frequency. Calculate the resonant frequency, the current in the circuit and voltages across the elements at resonance. Find also the quality factor and bandwidth. **ANS: f_r=1591.5494Hz, V_R=200V, V_L=2000V, V_C=2000V, Q=10, BW=159.15Hz**	C115.3	1,2,3
T.3.3	A series RLC circuit with R=5 ohm L=40 mH and C=1µF. Calculate (a) the Q of the circuit, (b) the separation between the half power frequencies, (c) the resonant frequency and (d) the half power frequencies f_1 and f_2. **ANS: (a) Q=40,** **(b) BW=19.89Hz, (c) f_r=795.77Hz, (d) f_1=785.83Hz & f_2=805.72Hz**	C115.3	1,2,3
T.3.4	A series circuit with R=10 ohm, L=0.1 H and C=50 µF has an applied voltage V=50 V with a variable frequency. Find the resonant frequency, the value of frequency at which maximum voltage occurs across the inductor and the value of frequency at which maximum voltage occurs across the capacitor. Explain what do you infer from the results. **ANS: f_L=72.08Hz, f_C=71.08Hz and f_r=71.18Hz**	C115.3	1,2,3,4
T.3.5	A series RLC circuit with R=10 ohm, L=0.2 mH and a variable capacitor has to resonate at 200KHz. Determine the value of C at resonance. **ANS: C=0.0031 µF**	C115.3	1,2,3
T.3.6	Two inductively coupled coils have self-inductances L1=50mH and L2=200mH. If the coefficient of coupling is 0.5, (i) Calculate the mutual inductance between the coils, and (ii) what is the maximum possible mutual inductance? **ANS: (i) M=50mH (ii) M=100mH**	C115.3	1,2,3

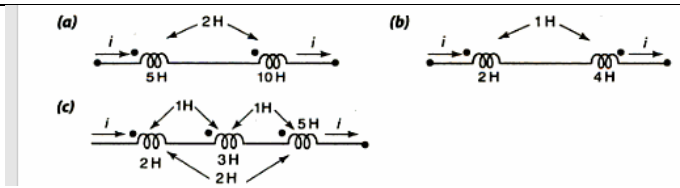
T.3.7	An amplifier with an output impedance of 1936 ohm is to feed a loudspeaker with an impedance of 4 ohm. (a) Calculate the desired turns ratio for an ideal transformer to connect the two systems, (b) An rms current of 20mA at 500Hz is flowing in the primary. Calculate the rms value of current in the secondary at 500Hz, (c) What is the power delivered to the load? **ANS: (a) $N_2/N_1=1/22$, (b) $I_{RMS}=0.44A$, (c) P=0.774W**	C115.3	1,2,3
T.3.8	A coil of 100 turns is wound uniformly over an insulator ring with a mean circumference of 2m and a uniform sectional area of 0.025cm^2. if the coil is carrying a current of 2A. calculate (a) the mmf of the circuit (b) magnetic field intensity (c) flux density (d) the total flux **ANS: (a) 2000AT (b) 1000AT/m (c) 1.2565mWb/m^2 (d) 0.00314×10^{-6} Wb**	C115.3	1,2,3
T.3.9	Calculate the effective inductance across a and b 	C115.3	1,2,3
T.3.10	The inductance matrix for the circuits of three series connected coupled coils is given. Find the inductances and indicate the dots for the coils. All elements are in Henrys. 	C115.3	1,2,3
UNIT IV - TRANSIENT RESPONSE FOR DC CIRCUITS			
T.4.1	A DC voltage of 100 volts is applied to a series RL circuit with R=25 ohm. Determine the current in the circuit at twice the time constant. **ANS: i(t) = 3.45A**	C115.4	1,2,3
T.4.2	In the circuit of the figure shown below, determine the expression for the transient current and the initial rate of growth of the transient current.  **ANS: $i(t) = 20 - 26e^{-\left(\frac{5}{3}\right)t}$, $\frac{di}{dt}\Big\|_{t=0} = 43.333$ A/sec**	C115.4	1,2,3
T.4.3	For the circuit shown in figure, determine the voltage across the resistor 0.5 ohm, when the switch, S is opened at t=0. Assume that there is no charge on the capacitor and no current in the inductor before switching.	C115.4	1,2,3

			
T.4.4	A Series RLC circuit comprising R=10 ohm, L= 0.5H, and C = 1 microfarad is excited by a constant voltage source of 100V. Obtain the expression for the transient current assuming initially relaxed conditions. **ANS:$i(t) = e^{-10t}(0.1414 \sin 1414.2t)$ A**	C115.4	1,2,3
T.4.5	For a source free RLC series circuit, the initial voltage across C is 10V and the initial current through L is zero. If L = 20mH, C=0.5 microfarad and R=100 ohm, evaluatei(t).	C115.4	1,2,3
T.4.6	Calculate the voltage over the capacitor for the time t>0. 	C115.4	1,2,3
T.4.7	Calculate the approximate voltage across the inductor 100ns after the switch is closed? 	C115.4	1,2,3
T.4.8	Determine the resonant frequency of the circuit. 	C115.4	1,2,3
T.4.9	If a simple RL circuit consisting of a 20Ω resistor in series with a 100mH inductor is connected to a 10V supply, from which it draws a current of 500mA after it has reached its steady state. Determine how long after switch on, will the current take to reach 316mA?	C115.4	1,2,3

T.4.10	Find the current in the circuit shown at an instant t, after opening the switch if a current of 1A had been passing through the circuit at the instant of opening.  **ANS: i(t)=6-5$e^{-\frac{6}{5}t}$**	C115.4	1,2,3
	UNIT V - THREE PHASE CIRCUITS		
T.5.1	A balanced star connected load of (4+j3) ohm per phase is connected to a balanced 3 phase 400V supply. The phase current is 12A. Determine (a) Total active power **ANS: P=6651W** (b) Reactive power **ANS: Q=4988.36 VAR** (c) Total apparent power **ANS: S=8313.84VA**	C115.5	1,2,3
T.5.2	The voltage across the terminals R and Y is 400. Calculate the values of three line voltages. Assume RYB phase sequence. **ANS: V_{RY}=400∟0^0** **V_{BY}=400∟-120^0 V_{BR}=400∟ -240^0**	C115.5	1,2,3
T.5.3	The input power to a three phase load is 10kW at 0.8pf. Two wattmeters are connected to measure the power, calculate the individual readings of the wattmeters. **ANS: W_1=7.165 kW and W_2=2.835 kW**	C115.5	1,2,3
T.5.4	A two-phase generator is connected to two 90Ω load resistors. Each coil generates 120 V AC. A common neutral line exists. Determine how much current flow through the common neutral line.	C115.5	1,2,3
T.5.5	Compare the total copper cross sections in terms of current-carrying capacity for a single-phase and a three-phase 120 V system with effective load resistance of 15Ω.	C115.5	1,2,4
T.5.6	If in a Y-connected ac generator, each phase voltage has a magnitude of 90 V_{RMS}, calculate the magnitude of each line voltage.	C115.5	1,2,3
T.5.7	Calculate the phase difference θ between the supply voltage and the supply current.  	C115.5	1,2,3
T.5.8	Determine total average power and total reactive power for the circuit having line voltage 208V and the wattmeter readings of the balanced system is P_1=-560W and P_2=800W.	C115.4	1,2,3
T.5.9	Determine power factor for the circuit having line voltage 208V and the wattmeter readings of the balanced system as P1=-560W and P2=800W.	C115.4	1,2,3

T.5.10	Calculate the total power input and readings of the two wattmeter's connected to measure power in a three phase balanced load, if the reactive power input is 15KVAR, and the load pf is 0.8 ANS: P=34641; W1=12990 & W2=21650	C115.4	1,2,3
	6.ASSIGNMENT QUESTIONS		
	UNIT I - BASIC CIRCUITS ANALYSIS		
A.1.1	An electric circuit has three terminals A,B,C. Between A and B is connected to a 2Ω resistor, between B and C are connected a 7Ω resistor and a 5Ω resistor in parallel and between A and C is connected a 1Ω resistor. A battery of 10V is then connected between terminals A and C. Determine (a) total current drawn from the battery, (b) voltage across the 2Ω resistor and (c) current passing through the 5Ω resistor. **ANS: (a) I_T =12A, (b) $V_{2\Omega}$ =4volts, (c) $I_{5\Omega}$ =1.17A**	C115.1	1,2,3
A.1.2	Determine the value of resistance R and current in each branch when the total current taken by the circuit is 6A.  **ANS: R=1.52 ohm**	C115.1	1,2,3
A.1.3	Determine the power delivered by the 5A current source in the circuit shown below using PSpice. [Refer Pg. No. 101 , 'Circuits and Networks Analysis and Synthesis' by A. Sudhakar and Shyammohan S Palli] 	C115.1	1,4,5
	UNIT II - NETWORK REDUCTION AND NETWORK THEOREMS FOR DCAND AC CIRCUITS		
A.2.1	Apply Source Transformation technique and replace the circuit shown in figure between terminals 'ab' with the voltage source in series with a single resistor.	C115.2	1,2,3

	 **ANS: V_{ab}=16.67V; R_{th} =2.38Ω**		
A.2.2	Determine the load resistance to receive maximum power from the source; also find the maximum power delivered to the load in the given circuit using PSpice. [Refer Pg. No. 155 , 'Circuits and Networks Analysis and Synthesis' by A. Sudhakar and Shyammohan S Palli] 	C115.2	1,4,5
A.2.3	A battery of unknown emf is connected across resistance as shown in the figure. The voltage drop across the 8Ω resistor is 20V. Determine the current through ammeter and emf of the battery.  **ANS: Ammeter reading=0.71A; Emf of the battery =67.38V**	C115.2	1,2,3
UNIT III - RESONANCE AND COUPLED CIRCUITS			
A.3.1	Determine the quality factor of a coil for the series circuit consisting of R=10Ω, L=0.1H and C=10μF.**ANS: Q=10**	C115.3	1,2,3
A.3.2	A voltage v(t) = 10sinωt is applied to a series RLC circuit. At the resonant frequency of the circuit, the maximum voltage across the capacitor is found to be 500V. Moreover, the bandwidth is known to be 400 rad/sec and the impedance at resonance is 100Ω. Determine the resonant frequency and also find the values of L and C of the circuit.**ANS: f_r= 4499Hz, L=0.25H, C=5nF**	C115.3	1,2,3
A.3.3	Categorize the following connections by examining the effective value of inductance.	C115.3	1,2,3,4

	 **ANS: a) Series aiding &L_{eq}=19H; (b) Series opposing &L_{eq}=4H; (c) Series aiding &L_{eq}=18H**		
A.3.4	A series RLC circuit consists of a 10Ω resistance, 0.1H inductance and 50μF capacitor with an applied voltage of 100V. Determine the resonant frequency, the voltage across the inductor and Q factor of the circuit using PSpice. [Refer Pg. No.336, 'Circuits and Networks Analysis and Synthesis' by A. Sudhakar and Shyammohan S Palli]	C115.3	1,2,3

SEMINAR TOPICS

S.No	Name of the Topic
1.	Water circuit analogy to electric circuits
2.	History of ohms' law
3.	Active and Passive components
4.	Linear and Nonlinear elements
5.	Bilateral and Unilateral element
6.	Lumped and Distributed element
7.	Power Triangle
8.	Impedance diagram
9.	AC vs DC
10.	Types of Resistor
11.	Types of Capacitor
12.	Types of Inductor
13.	Types of energy sources
14.	Types of electrical loads
15.	Single phase vs three phase system
16.	Effects of Harmonics
17.	Effects of phase sequence
18.	Effects of power factor
19.	Analogy between magnetic and electric circuit
20.	Application of differential equations to electric circuits
21.	Types of filters-LPF, HPF
22.	Types of Filters-Active and Passive
23.	Star connection vs delta connection
24.	Analog circuit
25.	Digital circuit
26.	Application of Reciprocity theorem
27.	Application of Maximum power transfer theorem
28.	Application of superposition theorem
29.	Transformer
30.	Chopper

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

Question Paper Code : 57448

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

Second Semester

Civil Engineering

HS 6251 – TECHNICAL ENGLISH – II

(Common to all Branches except Marine Engineering)

(Regulations 2013)

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

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. Rewrite the following in (impersonal) passive form : **(2 × 1 = 2)**

   (a) People expect that a new law will be introduced next year,

   (b) Somebody cleaned the room today.

2. Complete the following conditionals with the correct forms of the verbs : **(4 × ½ = 2)**

   (a) If I get the job, I ____ (help) the poor.

   (b) If I could go there, I ____ (buy) you the book you have been asking for.

   (c) If I hadn't gone to the party, I _____ (not, meet) the celebrity.

   (d) If it ____ (stop) working, I would buy a new television.

3. Fill in the blanks with suitable modal verbs choosing from the list given : **(4 × ½ = 2)**

   can , must, would, may, shall

   (a) We _____ start now; otherwise, it'll be too late.

   (b) _____ you mind waiting for a minute ?

   (c) I _____ lift this bag, don't bother.

   (d) The weather forecast says it _____ rain tomorrow.

4. Read each sentence and fill in the blank with the correct homonym : (4 × ½ = 2)

(a) Please try not to _____ your new bike, (lose, loose)

(b) _____ bike is parked in the pathway ? (Who's, Whose)

(c) The _____ ingredients of bread are flour, water, and yeast. (principal, principle)

(d) The counselor _____ the parents to spend quality time with their children. (adviced, advised)

5. Use any two of the following words in sentences of your own, write two sentences using the same word, bringing out the difference in meaning : (2 × 1 = 2)

(a) bow, (b) right, (c) fine, (d) race

6. Rewrite the following as numerical expressions. (4 × ½ = 2)

(a) a seminar for two days

(b) a team of eleven players

(c) an exam for three hours

(d) a flock of 1000 birds

7. Form sentences using any two of the following phrasal verbs. (2 × 1 = 2)

(a) put off (b) put out (c) call off (d) call out

8. Fill in the blanks with right options to complete the collocations. (4 × ½ = 2)

(a) Let's consult with the elders before we ____ a decision.

(i) do (ii) make

(iii) create (iv) construct

(b) The students always _____ attention in his class.

(i) give (ii) pay

(iii) keep (iv) make

57448

(c) It is a golden _____ we can't miss it.

(i) chance (ii) opportunity

(iii) offer (iv) possibility

(d) He should learn to ___ his emotions under control.

(i) keep (ii) hold

(iii) do (iv) make.

9. Combine the given two sentences into one sentence using appropriate clause. (2 × 1 = 2)

(a) He ate the sandwiches. He made them.

(b) I met Sam in the Seminar. He is a teacher.

10. Each sentence given below contains an idiom (underlined). From the given alternatives, choose the one that best expresses the meaning of the idiom. (4 × ½ = 2)

(a) Both our professors have the gift of the gab.

(i) they are gifted

(ii) they are talkative

(iii) they are good conversationalists,

(b) The teacher had to use a firm hand to handle the unruly students.

(i) exercise high degree of discipline

(ii) Use a solid hand

(iii) be aggressive

(c) My friend doesn't see eye to eye with his parents.

(i) agree on things

(ii) take care of

(iii) stay

(d) In a sensitive relationship, everything is a bone of contention.

(i) a unifying factor

(ii) Something that causes trouble

(iii) a firm view

PART – B (5 × 16 = 80 Marks)

11. Read the following passage and answer the questions given below :

With Hard Work and Self Belief You Can Innovate Too!

We humans have evolved a lot. From the Stone Age to the Silicon Age, we have not only transformed our life style but also the world we live in. This was possible only because of our understanding of our surroundings and the components of our environment. The modern world is a dynamic one. Its face keeps changing because of the developments made possible by science. What were once considered fantasy and figments of the imagination are now reality. The Mars expedition, disease-resistant crops, mobile phones, satellite communication, cloning — all these and much more are the offshoots of advances in science and technology.

I will not be exaggerating if I say that the successful research endeavours of the last century play a major role in the way we lead our lives now. No one can categorically say what technology will define, transform, and revolutionise in the coming years. But we can make a well-thought-out conjecture.

Considering the kind of impact computers and computational systems have on almost all of our ventures like education, communication, vocation, entertainment and media, it cannot be denied that they will play a key role in this century too. It should be mentioned that almost all fields of knowledge are interlinked. Interdisciplinary research is done more than ever now. In fact it is the best thing that could have happened for the frontiers of science.

Individuals who have a passion for their subjects can always apply what they specialise in to any form or genre of knowledge. A golf enthusiast may find ways to hit a ball by using kinematics — a branch of classical mechanics that describes motions in terms of position, velocity and acceleration. A cricket crazy individual can help a bowler fine-tune the reverse swing by helping him understand the applications of fluid dynamics. A nanotechnologist can flawlessly modify car windscreens' surfaces into super-hydrophobic surfaces and ensure an easy drive even during a deluge.

These are just a few examples of how technocrats can apply technology to make life easy and comfortable for us and also find solutions to larger problems like depleting fuel resources, melting of glaciers, unpredictable weather conditions and extinction of life forms.

All said and done, I wonder why as students we do not understand or appreciate these innovations and do not even make any attempt to apply what we learn ?

5

"When you start in science, you are brainwashed into believing how careful you must be, and how difficult it is to discover things. There's something that might be called the 'graduate student syndrome'; graduate students hardly believe they can make a discovery," said professor Francis Henry Compton Crick. As youngsters and students you may be under the belief that you need to possess extraordinary skills and talent to innovate and discover. But in reality it is not so. If you do a bit of thinking you will agree with my statement. Individuals who have contributed through inventions and discoveries were normal people like you and me. But they believed in themselves and worked hard. Failure did not stop them from trying. Scientists like Edison stand as examples. You need to be creative and look at things in a different way. Lateral thinking is a skill that you need to develop. Several people must have observed a fruit falling from a tree. But it was only Newton who thought about why it should go down perpendicularly and further inquiry into the issue helped us understand what gravity is.

So see beyond and further, and with that sense of self belief, you could also innovate.

(a) Say whether the following statement are True or False : **(4)**

(i) Science has not really altered the world we live in.

(ii) The author categorically says computers will play a major role in this century as well

(iii) One need not have extra-ordinary skills to innovate.

(iv) Common people cannot innovate or discover.

(b) Choose the best answer from the choices given : **(4)**

(i) 'But we can make a well-thought-out conjecture.' means:

a. We can make a clever inference,

b. we can make a hasty decision,

c. we can get confused

(ii) What is the best thing that has happened for the advancement of science ?

a. inter disciplinary research,

b. invention of computers,

c. research in nonotechnology

(iii) Scientists like Edison stand as example for

a. extraordinary skill and talent,

b. self belief and hard work,

c. lethargy and creativity

b

(iv) What differentiated Newton from others ?

a. he was the one who watched a fruit fall,

b. he was not extraordinarily talented,

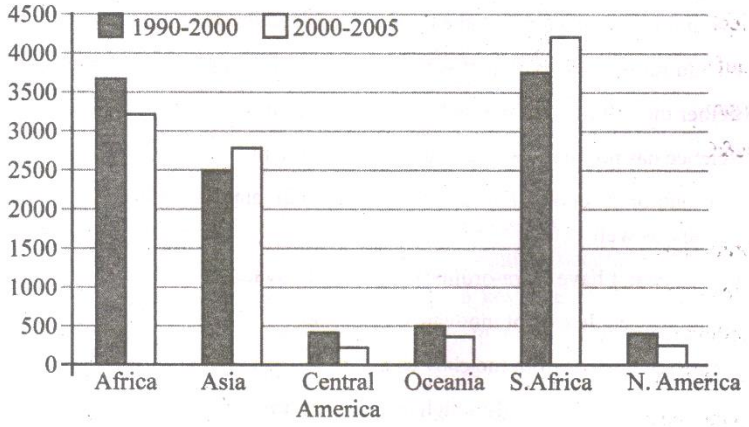
c. he inquired why the fruit should fall perpendicularly

(c) Write a short summary of the above given passage in not more than **100** words. **(8)**

12. (a) Write a paragraph comparing tropical deforestation that occurred in different geographical regions based on the data given below. Interpret the data : **(16)**

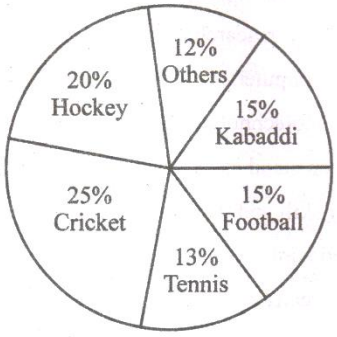
TROPICAL DEFORESTATION BY REGION, 1990-2000 & 2000-2005

In thousands of hectares per year Data source : FAO/mongabay.com



OR

(b) The Pie chart given below shows the spending of a country on various sports during a particular year. The total amount spent is hundred crores of rupees. Study the chart and interpret the data in 250 words : **(16)**



13. Respond to the following with a job application and resume. (16)

(a) Mac & Co needs Project Managers. They will be responsible for the delivery of substantial projects in an area of strategic importance in various fields of engineering. The candidate will be expected to make strategic and technical decisions regarding the budget, manpower resourcing and design. The main responsibilities will also include planning and executing and ensuring the project team are motivated and focused, having clear targets and milestone deliverables. Candidates with a first class engineering degree (all disciplines) can apply. They are also expected to be knowledgeable and experienced in the project management lifecycle including concept design, detail design, manufacture testing, maintenance and commissioning electro-mechanical equipment. Send your application with your resume to The HR Manager, Mac&Co., First Street, Parrys Corner, Chennai 1.

OR

(b) Vibrant Inc - one of the best and most innovative research agencies in the State - invites applications for the post of Resource Coordinator. The Resource Coordinator will play a fundamental role in the running of research projects. They will also identify and pool all necessary resources to deliver research projects, ensure smooth running of the projects, schedule people to be in the right place at the right time etc. Candidates with a first class engineering degree (any discipline) with proven record of leadership and coordination are eligible. Apply electronically with a resume to career@vibrant.com.

14. Write a report based on one of the following : (16)

(a) You are heading the Marketing Team of a famous mobile phone manufacturing firm which has plans to introduce a new mobile phone in a metropolitan city. Prepare a report in about 300 words advising the firm on the feasibility of introducing the new model. Your study findings may focus on the popularity of the available brands, reasons for popularity, their price etc and also how your brand is different from those in the market.

OR

(b) A college is planning to convert all of its classrooms as smart classrooms. As the Professor in charge of academic development you are requested to study the feasibility and submit a report. You need to consider the finance involved, advantages and disadvantages of smart classes etc. **(16)**

15. Write a dialogue for <u>one</u> of the following situations : **(16)**

(a) Share Akash your thoughts about pollution in the water bodies and ways to keep them clean. Write out this dialogue. The first exchange is given for you to start the dialogue

You : Hello Akash! How are you ?

Akash : I am fine. How are you ?

You : I am fine too. Hey, did you read today's Hindu ? In fact almost all papers have carried news on city's polluted water bodies ... I am really worried .....

OR

(b) Your younger brother likes only junk food. So you decide to have a chat and make him understand the ill effects. Write out this dialogue. The first exchange is given for you to start the dialogue.

You : Sanjay, have you noticed that you're putting on weight ?

He : Yeah...

You : Have you thought about it ?

9

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

Question Paper Code : 80547

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

Second Semester

Civil Engineering

HS 6251 — TECHNICAL ENGLISH – II

(Common to all branches except marine engineering)

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Rewrite the following sentences in impersonal passive form : (2 × 1 = 2)

   (a) We used this auditorium only on special occasions.

   (b) The paint prevents the metal from corrosion.

2. Fill in the blanks with the correct homophones from the words given : (4 × ½ = 2)

   (a) Buy some ———— (stationery/stationary) from the shop.

   (b) Empty bottle has little ———— (wait/weight).

   (c) The opening ———— (scene/seen) of the play was set in the forest.

   (d) The king requested ———— (piece/peace) in his kingdom.

3. Fill in the blanks with modal verbs conveying the meaning indicated in the brackets : (4 × ½ = 2)

   (a) ———— I borrow your book? (Permission)

   (b) You ———— submit your records for correction tomorrow. (obligation)

   (c) I ———— accept this offer if I were you. (Advice)

   (d) The books ———— arrive tomorrow. (Certainty)

10

4. Use the appropriate phrasal verbs chosen from the given list : (4 × ½ = 2)

(Washed away, look to, put off, give up)

(a) We will have to _____ meeting.

(b) Rough seas _____ 100 houses in the coastal towns.

(c) Young cricketers _____ Sachin Tendulkar.

(d) You need to _____ your bad habits.

5. Combine each pair of sentences given below with suitable cause and effect expressions : (2 × 1 = 2)

(a) The steel tray is painted black. The black paint prevents the heat from escaping.

(b) Rani fainted in the class. She did not have her breakfast.

6. Frame sentences by using any TWO of the following words both as a noun and a verb without change in spelling : (4 × ½ = 2)

(a) Name

(b) Clean

(c) Look

(d) Talk.

7. Rewrite the following as Numerical Expressions : (4 × ½ = 2)

(a) A pipe that is 5 feet long

(b) A journey of 1000 miles

(c) A budget estimate of 5 lakhs.

(d) A conference lasting 3 days.

8. Use the following idioms by choosing the correct one for the blanks given. Make necessary changes in tenses : (4 × ½ = 2)

(behind bars, cats and dogs, hale and hearty, lame excuse)

(a) My grandfather is 95, but he is still _____.

(b) His brother is _____ for stealing bikes

(c) My uncle and aunt still fight like _____ though they have been married 20 years.

(d) Most people give a _____ for not coming to work on time.

9. Complete the following sentences by inserting the suitable collocations in the blanks taken from the given list : (4 × ½ = 2)

(tasted awful, splendid performance, proper manner, delicious meal)

(a) My mother cooked us a ————————

(b) The food in the restaurant ————————

(c) The dance master praised him for his ————————

(d) Radha dresses in a ———————— when she goes abroad.

10. Combine the two sentences with appropriate clause : (2 × 1 = 2)

(a) Plastic is banned in many cities. People still use it.

(b) Dr. Kumar is a scientist. He has written many books.

PART B — (5 × 16 = 80 marks)

11. Attempt both (a) and (b) :

A close look at the facts relating to political interference in administration shows that it is not a one-way process. There is often a nexus between power hungry and corrupt politicians and civil servants with convenient principles. Many civil servants are only too anxious to oblige the politicians, and then cash the obligation when they need some special favour. So the attitude of self-righteousness adopted by the civil service is sometimes only a way of covering their own flaws by blaming others.

Every now and then some retired civil servants come out with his memoirs, painting a glorious picture of the heights of administrative efficiency reached during his reign. There is often the suggestion that had there not been so much political interference, things would have been even more fantastic. It is not unusual for the self styled hero to blame not only interfering politicians but also fellow civil servants who are idiots or crooks, for his failures. This attitude of smug self-satisfaction is, unfortunately, developed during the years of service. Self preservation rather than service is encouraged by our whole system of rules and procedures. The remedy has to be drastic and quickly effective. The over protection now granted to civil servants must end. Today to remove an erring civil servant is just not possible. And the only thing that the highest authority in the Government, both in the State and at the centre, can do is to transfer an official from one job to another. The rules for taking disciplinary action are so complicated that, in the end, the defaulting civil servants gets away, and gets his full emoluments even for the period of the disciplinary proceedings, thus making it a paid holiday for him.

The result is that the administration has become rule-oriented and not result-oriented. Action is possible against the official who takes some interest in his work, but no action is ever taken against a person who does not deliver the goods. If the country is to adopt a result-oriented approach, it is necessary to link job performance with job retention.

(a) (i) Choose the correct option : (4 × 1 = 4)

(1) The facts relating to the problem of political interference indicate that :

(A) Honest bureaucrats an always being troubled by politicians.

(B) Politicians are often misled and trapped by civil servants.

(C) Politicians and civil servants co-operate to gain mutual advantages.

(D) Politicians and civil servants use interference as an excuse for victimising the common man.

(2) Civil servants who write their memoirs after retiring :

(A) Claim that they would have achieved outstanding success if interference had not come in the way.

(B) Prove that constant political interference made it impossible for them to do anything properly.

(C) Complain that the credit for their achievements goes to dishonest politicians.

(D) Prove that people of inferior quality in the civil service bring about interference.

(3) The existing system of administration seems to encourage civil servants :

(A) To become self-styled heroes and boss over others.

(B) To present a glorious picture of the administration.

(C) To become self-centred and concerned mainly about their own gain.

(D) To become self-righteous and fight back against corrupt politicians.

(4) The problem with the present set-up needing urgent action is :

(A) A lack of accountability on the part of civil servants.

(B) A lack of control over the power of politicians.

(C) A neglect of the ideals of self-righteousness.

(D) Complicated rules and procedures that greatly reduce efficiency.

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(ii) Give short answers : (2 × 2 = 4)

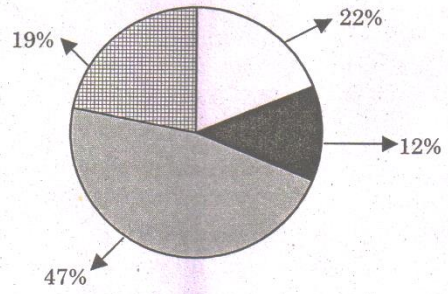
(1) How do the government punish the erring Civil Servant?

(2) What is written by the civil servants in their memoirs?

(iii) Prepare a check list of four things that a person should do to become a civil servant : (4 × 1 = 4)

(b) The following chart represents how the British accessed the Internet in the year 2010. Analyse the given data and write a paragraph of 150 words : (4 × 1 = 4)

How the British accessed the internet in 2010?



12. (a) Read any one of the following passages and answer the questions given below :

On the death of Alexander the great his vast empire was almost immediately broken up into three main divisions. In the East, his General Seleucus Nikator founded an empire comprising Persia, Mesopotamia, Syria and part of Asia Minor, that is, almost all the area from the Hellespont to the Indus. The capital of this empire was Antioch, which became one of the greatest commercial centres of those times, through which merchandise for Arabia, India and China flowed into the Mediterranean.

The second division of the Alexandrian empire was the Graeco-Egyptian kingdom founded by Ptolemy I, another general of Alexander. Its chief city was Alexandria which, with its safe harbour and splendid library, became for a long time the most important centre of Greek civilization and culture in the ancient world.

The third and the smallest division was Macedon, ruled by Antigonus and his successor, who had partial control over Greece till 146 B.C. In that year, Greece was made a Roman province under name of Achaea. Later, both Syria and Egypt were also conquered by the Romans.

(i) Write a short summary of the above given passage in not more than 100 words. (6)

(ii) Answer the following questions in not more than 3 sentences : (5 × 2 = 10)

(1) Who was Antigonus?

(2) When Alexander died, what happened to his empire?

(3) Name the biggest division of Alexander's Empire and its boundaries.

(4) What may be the reasons for the disintegration of Alexander's empire? Give two reasons.

(5) What are the specialities of Antioch, the city in the East?

Or

(b) Read the following passage and answer the questions given below :

Now the question arises, what is the secret of the longevity and imperishability of Indian culture? Why is it that such great empires and nations is Babylon, Assyria, Greece, Rome and Persia, could not last more than the footprints of a camel in the shifting sands of the desert, while India which faced the same ups and downs, the same mighty and cruel hand of time, is still alive and with the same halo of glory and splendour? The answer is given by Prof. J. B. Pratt of America. According to him Hindu religion is the only religion in the world which is 'self-perpetuating and self-renewing.

Unlike other religions 'not death, but development' has been the fate of Hinduism. Not only Hindu religion but the whole culture of the Hindus has been growing changing and developing in accordance with the needs of time and circumstance without losing its essential and imperishable spirit. The culture of the Vedic ages, of the ages of the Upanishads, the philosophical systems, the Mahabharata, the Smirities, the Puranas, the commentators, the medieval saints and of the age of the modern reformers is the same in Spirit and yet very different in form. Its basic principles are so broad based that they can be adapted to almost any environment of development.

(i) Write a short summary of the above given passage in not more than 100 words : (6)

(ii) Answer the following questions in not more than 3 sentences : (5 × 2 = 10)

(1) What changes has the spirit of Indian culture undergone during its long history right from the vedic age down to the present times?

(2) What is the characteristic quality of the basic principles of Indian culture?

(3) What, according to J.B. Pratt, is the secret of the longevity and imperishability of Indian culture?

(4) What is the speciality of the Hindu religion when compared to other religion?

(5) To what is the perishing cultures compared to?

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13. (a) Write a letter to your friend reviewing a regional movie which you watched recently.

Or

(b) Write a letter to your friend congratulating him for winning National Level General Knowledge competition.

14. (a) Write a letter of application for the post of Software Engineer. Candidates should have good communication skills and leadership skills. Send your Resume to :

HRD Manager,

Global Info tech,

Chennai.

Or

(b) Samsung requires Production Engineers for their new factory near Chennai. Engineering graduates with 2 years experience in manufacturing industry Send your e-resume to samsunghrc@gmail.com.

15. (a) Assume that you are the class representative of your class. You have recently visited Kalpakkam atomic power station. Write a report to your Head of the Department about your visit to Kalpakkam in detail.

Or

(b) Write a feasibility report on the introduction of a new beauty soap in the market to the Managing Director of your company.

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

Question Paper Code : 57499

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

Second Semester

Civil Engineering

MA 6251 – MATHEMATICS – II

(Common all branches except Marine Engineering)

(Regulation 2013)

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

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. Evaluate $\nabla^2 \log r$.

2. State Stokes' theorem.

3. Solve $(D^2 + D + 1)y = 0$

4. If $1 \pm 2i$, $1 \pm 2i$ are the roots of the auxiliary equation corresponding to a fourth order homogenous linear differential equation $F(D)y = 0$, find its solution.

5. State convolution theorem on laplace transforms.

6. Evaluate $L^{-1}\left(\frac{s}{s^2 + 4s + 5}\right)$.

7. Give an example of a function where u and v are harmonic but u + iv is not analytic.

8. Find the critical points of the map $w^2 = (z - \alpha)(z - \beta)$.

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9. Expand $f(z) = \frac{1}{z^2}$ as a Taylor series about the point $z = 2$.

10. Evaluate the residue of $f(z) = \tan z$ at its singularities.

PART – B (5 × 16 = 80 Marks)

11. (a) (i) If $\nabla \phi = 2xyz^3\vec{i} + x^2z^3\vec{j} + 3x^2yz^2\vec{k}$ find $\phi(x, y, z)$ given that $\phi(1, -2, 2) = 4$. **(8)**

(ii) Using Green's theorem in a plane evaluate

$\int_C [x^2(1 + y)dx + (x^3 + y^3)dy]$ where C is the square formed by $x = \pm 1$ and $y = \pm 1$. **(8)**

OR

(b) (i) Find 'a' and 'b' so that the surfaces $ax^3 - by^2z = (a + 3)x^2$ and $4x^2y - z^3 = 11$ cut orthogonally at $(2, -1, -3)$ **(8)**

(ii) Prove that Curl Curl $\vec{F}$ = grad div $\vec{F} - \nabla^2\vec{F}$. **(8)**

12. (a) (i) Solve $(D^2 + 2D + 1)y = xe^{-x}\cos x$. **(8)**

(ii) Solve the equation $(x^2D^2 - xD - 2)\,y = x^2 \log x$. **(8)**

OR

(b) (i) Solve the following simultaneous equations $\frac{dx}{dt} - y = t$; $\frac{dy}{dt} + x = t^2$. **(8)**

(ii) Solve the equation $y'' + y = \tan x$ using the method of variation of parameters. **(8)**

13. (a) (i) Evaluate :

(1) $L(t^2 e^{-t}\cos t)$

(2) $L^{-1}\left[e^{-2s}\frac{1}{(s^2 + s + 1)^2}\right]$ **(4) + (4)**

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(ii) Find the inverse Laplace transform of $\frac{s}{(s^2 + a^2)(s^2 + b^2)}$ using convolution theorem. **(8)**

OR

(b) (i) Find the Laplace transform of f(t) defined by

$$f(t) = \begin{cases} E & \text{if } 0 < t < a/2 \\ -E & \text{if } a/2 < t < a \end{cases} \text{ where } f(t + a) = f(t).$$ **(8)**

(ii) Using Laplace transforms technique solve $y'' + y' = t^2 + 2t$, given $y = 4$, $y' = -2$ when $t = 0$. **(8)**

14. (a) (i) If $f(z) = u + iv$ is an analytic function in $z = x + iy$ then prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|u|^2 = 2|f'(z)|^2$. **(8)**

(ii) Prove that $w = \frac{z}{z + a}$ where $a \neq 0$ is analytic whereas $w = \frac{\bar{z}}{\bar{z} + a}$ is not analytic. **(8)**

OR

(b) (i) Can $v = \tan^{-1}\left(\frac{y}{x}\right)$ be the imaginary part of an analytic function ? If so construct an analytic function $f(z) = u + iv$, taking v as the imaginary part and hence find u. **(8)**

(ii) Find the bilinear transformation that transforms the points $z = 1, i, -1$ of the z-plane into the points $w = 2, i, -2$ of the w-plane. **(8)**

15. (a) (i) Evaluate using Cauchy's integral formula : $\int_C \frac{(z + 1)}{(z - 3)(z - 1)} dz$ where C is the circle $|z| = 2$. **(8)**

(ii) Evaluate $\int_0^{2\pi} \frac{d\theta}{13 + 12\cos\theta}$ by using contour integration. **(8)**

OR

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(b) (i) Expand as a Laurent's series the function $f(z) = \frac{z}{(z^2 - 3z + 2)}$ in the region

(1) $|z| < 1$

(2) $1 < |z| < 2$

(3) $|z| > 2$ **(8)**

(ii) Evaluate $\int_0^\infty \frac{x \sin mx}{x^2 + a^2} dx$ where $a > 0$, $m > 0$. **(8)**

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

Question Paper Code : 80606

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

Second Semester

Civil Engineering

MA 6251 — MATHEMATICS – II

(Common to all branches except Marine Engineering)

(Regulation 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Find the unit normal to $xy = z^2$ at $(1, 1, -1)$.

2. Using Green's theorem, evaluate $\int_C (x\,dy - y\,dx)$, where C is the circle $x^2 + y^2 = 1$ in the xy-plane.

3. Find the particular integral of $(D^2 + 2D + 1)\,y = e^{-x}x^2$.

4. Convert the equation $x^2\frac{d^2y}{dx^2} - 2x\frac{dy}{dx} + 2y = \log x$ into a differential equation with constant coefficients.

5. State the sufficient conditions for the existence of Laplace transform.

6. Find the inverse Laplace transform of $\frac{s}{(s+2)^2}$.

7. Find the value of m if $u = 2x^2 - my^2 + 3x$ is harmonic.

8. Find the image of the circle $|z| = 3$ under the transformation $w = 2z$.

9. State Cauchy's integral theorem.

10. Find the residue of $f(z) = \tan z$ at $z = \frac{\pi}{2}$.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Find the angle between the surfaces $x^2 + y^2 + z^2 = 9$ and $z = x^2 + y^2 - 3$ at the point (2, –1, 2) (8)

(ii) Prove that $\vec{F} = (y^2 \cos x + z^3)\hat{i} + (2y \sin x - 4)\hat{j} + 3xz^2\hat{k}$ is irrotational and find its scalar potential. (8)

Or

(b) (i) Find the directional derivative of $\varphi = 4xz^2 + x^2yz$ at (1, –2, 1) in the direction of $2\hat{i} + 3\hat{j} + 4\hat{k}$. (4)

(ii) Verify Gauss divergence theorem for

$\vec{F} = (x^2 - yz)\hat{i} + (y^2 - zx)\hat{j} + (z^2 - xy)\hat{k}$, where S is the surface of the cube formed by the planes $x = 0$, $x = 1$, $y = 0$, $y = 1$, $z = 0$ and $z = 1$. (12)

12. (a) (i) Solve : $(D^2 + 2D + 2)y = e^{-2x} + \cos 2x$. (8)

(ii) Using method of variation of parameters, solve $\frac{d^2y}{dx^2} + y = \sec x$. (8)

Or

(b) (i) Solve : $x^2\frac{d^2y}{dx^2} - x\frac{dy}{dx} + y = \log x$. (8)

(ii) Solve the following equations : $\frac{dx}{dt} + 2x + 3y = 0$; $3x + \frac{dy}{dt} + 2y = 2e^{2t}$. (8)

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13. (a) (i) Find the Laplace transform of the following functions :

(1) $\frac{e^{-t}\sin t}{t}$

(2) $t^2\cos t$. (8)

(ii) Using Laplace transform, solve $(D^2+3D+2)y = e^{-3t}$ given $y(0)=1$ and $y'(0)=-1$. (8)

Or

(b) (i) Using convolution theorem, find $L^{-1}\left\{\frac{s}{(s^2+4)(s^2+9)}\right\}$. (8)

(ii) Find the Laplace transform of the square wave function defined by

$$f(t)=\begin{cases} k, & 0<t<\frac{a}{2}, \quad f(t+a)=f(t) \\ -k, & \frac{a}{2}<t<a, \end{cases}$$ (8)

14. (a) (i) If $f(z)=u(x,y)+iv(x,y)$ is an analytic function, show that the curves $u(x,y)=c_1$ and $v(x,y)=c_2$ cut orthogonally. (8)

(ii) Find the analytic function $f(z)=u+iv$ whose real part is $u=e^x(x\cos y - y\sin y)$. Find also the conjugate harmonic of u. (8)

Or

(b) (i) Show that the transformation $w=\frac{1}{z}$ transforms in general, circles and straight lines into circles or straight lines. (8)

(ii) Find the bilinear transformation which maps the points $z=0, 1, -1$ onto the points $w=-1, 0, \infty$. Find also the invariant points of the transformation. (8)

15. (a) (i) Using Cauchy's integral formula, evaluate $\int_C \frac{z\,dz}{(z-1)^2(z+2)}$, where C is the circle $|z-1|=1$. (8)

(ii) Using Contour integration evaluate $\int_0^\infty \frac{\cos mx\ dx}{x^2+a^2}$. (8)

Or

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(b) (i) Find the Laurent's series expansion of $f(z) = \dfrac{1}{z^2 + 5z + 6}$ valid in the region $1 < |z+1| < 2$. (8)

(ii) Evaluate $\int_C \dfrac{z\, dz}{(z^2+1)^2}$, where C is the circle $|z - i| = 1$, using Cauchy's residue theorem. (8)

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

Question Paper Code : 57700

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

Second Semester

Civil Engineering

PH 6251 – ENGINEERING PHYSICS – II

(Common to all branches except Biotechnology and Pharmaceutical Technology)

(Regulations 2013)

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

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. Distinguish between drift velocity and thermal velocity of an electron.
2. What are the essential features of quantum free electron theory ?
3. What is Hall voltage ? Hall voltage of an extrinsic semiconductor depends on what properties of the material ?
4. The electrical resistivity of certain intrinsic semiconductor is 0.40 Ω m. The electron and hole motilities are 0.64 $m^2 V^{-1} s^{-1}$ and 0.36 $m^2 V^{-1} s^{-1}$ respectively. Calculate the electron and hole densities.
5. What are the properties required for a material to be suitable for making electromagnet ? Give examples.
6. What is London penetration depth ?
7. How does a dielectric material find its application in gas lighters ?

8. Calculate the electronic polarizability for argon atom. Given $\varepsilon_r = 1.0024$ at NTP and $N = 2.7 \times 10^{25} m^{-3}$.

9. Define the term birefringence.

10. What are metallic glasses ? Give two important characteristic properties of these materials.

PART – B (5 × 16 = 80 Marks)

11. (a) (i) Derive the expressions for electrical and thermal conductivities of metals based on classical free electron theory. Discuss how far they were successful in explaining the experimental results. **(12)**

(ii) A 5.8 m length and 2.0 mm diameter wire carries a current of 750 mA current, when the applied potential across its ends is 22 mV. If the drift speed of the electrons is 7.2×10^5 m/s, calculate the electrical resistivity of the wire and the conduction electron density of the material of the wire. **(4)**

OR

(b) (i) Explain Fermi-Dirac distribution function and discuss its behaviour with respect to temperature. Also represent it graphically. **(6)**

(ii) Assuming the expression for density of energy states, find the expression for conduction electron density in metals. How does it change with temperature ? **(6)**

(iii) The electrical conductivity of Cu at room temperature is 5.9×10^7 $\Omega^{-1}m^{-1}$. The Fermi energy for Cu is 7.0 eV and the conduction electron density is 8.4×10^{28} electrons m^{-3}. Calculate the Fermi velocity and mean free path of the electrons. **(4)**

12. (a) Explain the electrical properties of an intrinsic semiconductor based on band theory. Derive an expression for electron density in the conduction band and explain how it changes with temperature. **(16)**

OR

(b) Derive an expression for Fermi energy level in a n-type semiconductor. Discuss the variation the Fermi level with temperature along with graphical representation and show that n-type semiconductor behaves as an intrinsic semiconductor at high temperature. **(16)**

13. (a) (i) Distinguish between hard and soft magnetic materials with their applications. **(8)**

(ii) Write a note on ferrites. Give reasons why ferrites are preferred over ferromagnetic materials as core materials for high frequency applications. **(8)**

OR

(b) (i) Distinguish between type I and type II superconductors. **(8)**

(ii) Explain BCS theory of superconductivity. **(4)**

(iii) Explain SQUID. **(4)**

14. (a) (i) Derive an expression for the Lorentz field developed inside a dielectric material when it is placed in a electric field. **(12)**

(ii) Explain any two important dielectric breakdown mechanism. **(4)**

OR

(b) (i) Explain the phenomenon of ferroelectricity. Explain the ferroelectric properties exhibited by $BaTiO_3$ crystal. **(12)**

(ii) How does a dielectric material behave when it is placed in a A.C field ? **(4)**

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15. (a) (i) Explain the characteristic properties exhibited by NiTi shape memory alloy. **(8)**

(ii) Write a note on NLO materials. **(8)**

OR

(b) (i) Explain pulsed laser deposition method of preparing nano materials. What are the advantages of this method compared to other methods ? **(8)**

(ii) Explain the application of biomaterials in the fields of orthopedics. **(8)**

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

Question Paper Code : 80840

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

Second Semester

Civil Engineering

PH 6251 — ENGINEERING PHYSICS – II

(Common to all branches except Biotechnology and Pharmaceutical Technology)

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the properties of metals described inadequately by Drude's – model?
2. Define the mobility of electrons.
3. Define fermilevel and write its expression.
4. Sketch a graph between electrical conductivity and temperature of an intrinsic semiconductor.
5. Compare Para and ferromagnetic materials.
6. What is SQUID and mention its uses?
7. Define dielectric loss.
8. Write the applications of ferroelectric materials?
9. What are shape memory alloys?
10. Mention any four methods to produce nano materials.

PART B — (5 × 16 = 80 marks)

11. (a) Derive the expression for electrical and thermal conductivities of a metal, hence obtain the expression for Wiedemann-Franz law. (6 + 6 + 4)

Or

(b) Define density of energy states? Derive the expression for the density of energy states in metals. (2 + 14)

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12. (a) Derive the expression for the carrier concentration in an intrinsic semiconductor and show the variation of fermilevel with temperature with a neat diagram.

Or

(b) Obtain an expression for the carrier concentration of electrons in the conduction band of an n-type semiconductor.

13. (a) What are the different types of magnetic materials? Explain each magnetic material in detail with diagrams.

Or

(b) Write an essay on different types of superconducting materials, their properties and their applications.

14. (a) Explain the different types of polarization mechanisms in dielectrics and sketch their dependence on the frequency of applied electric field.

Or

(b) What is meant by local field in a dielectric and how it is calculated for a cubic structure? Deduce Clausius-Mosotti relation.

15. (a) What are metallic glasses? How are they prepared? Explain their use as transformer core material.

Or

(b) Explain biomaterial and its applications in the field of medicine.

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

Question Paper Code : 80310

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

Second Semester

Civil Engineering

CY 6251 — ENGINEERING CHEMISTRY – II

(Common to All Branches Except Marine Engineering)

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Mention any two requirements of boiler feed water.

2. What is calgon conditioning of water?

3. What is electroless plating?

4. With suitable example, explain the concept of galvanic corrosion.

5. Point out the advantages of wind energy.

6. What is the significance of breeder reactor?

7. Why is gypsum added to cement?

8. Classify refractories. Give one example each.

9. Define cetane number.

10. What is bio-diesel? Mention its advantages.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain the Zeolite softening process of water. (8)

(ii) Describe the reverse osmosis method for the desalination of brackish water. (8)

Or

(b) (i) Explain the demineralization of water by ion exchange process. (8)

(ii) Discuss the causes, problems and prevention of caustic embrittlement. (8)

12. (a) (i) Explain the principle and mechanism of chemical corrosion. (8)

(ii) Describe the sacrificial anode and impressed current cathode method of corrosion control. (8)

Or

(b) (i) What is paint? Explain its constituents and functions. (8)

(ii) Give a detailed account on copper electroplating. (8)

13. (a) (i) Describe the components of a light water nuclear reactor with a suitable diagram. (8)

(ii) Explain the construction and working of Hydrogen-Oxygen fuel cell. (8)

Or

(b) (i) Write a note on solar energy. (8)

(ii) With the help of required cell reactions, describe the construction and working of nickel-cadmium batteries. (8)

14. (a) (i) What are refractories? Explain any three of their important properties. (8)

(ii) What is glass? Discuss the manufacture of glass. (8)

Or

(b) (i) Describe the manufacture of cement by wet process. (8)

(ii) What are abrasives? How are they classified? Give any two examples for each category with their properties and uses. (8)

15. (a) (i) How will you carry out flue gas analysis by Orsat method? Explain. (8)

(ii) Write short notes on the following :

(1) Ignition temperature

(2) Explosive range (8)

Or

(b) (i) What is producer gas? Discuss the manufacture of producer gas. (8)

(ii) What is carbonization? Describe the Otto-Hoffman's process for preparing metallurgical coke. (8)

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

Question Paper Code : 57267

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

Second Semester

Civil Engineering

CY 6251 – ENGINEERING CHEMISTRY – II

(Common to all Branches except Marine Engineering)

(Regulations 2013)

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

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. List out the requirements of boiler feed water.
2. Why Calgon conditioning is better than phosphate conditioning ?
3. What is an electrochemical series ?
4. What are the essential ingredients of paints ?
5. What are batteries ?
6. Differentiate between nuclear fission and nuclear fusion.
7. Define abrasives.
8. What are refractories ?
9. What is meant by calorific value of a fuel ?
10. Give the composition of producer gas.

81

PART – B (5 × 16 = 80 Marks)

11. (a) (i) With neat diagram, explain the Zeolite process for water treatment. **(8)**

(ii) Describe the demineralization process of water softening and write down the reaction involved in it. **(8)**

OR

(b) (i) Explain with neat diagram, the desalination of brackish water of reverse osmosis method. **(8)**

(ii) Describe the carbonate and phosphate conditioning of water to overcome the boiler feed problems. **(8)**

12. (a) (i) Explain how corrosion is controlled by sacrificial anode. **(8)**

(ii) Derive Nernst equation and write its applications. **(8)**

OR

(b) (i) Discuss the importance of design and material selection in controlling corrosion. **(8)**

(ii) Write a note on

- Galvanic corrosion
- Differential aerated corrosion **(8)**

13. (a) (i) Describe the construction of lead-acid battery with reaction occurring during discharging. **(8)**

(ii) What is a breeder reactor ? Describe with a neat diagram the conversion of U-235 into Pu-239. **(8)**

OR

(b) (i) With a neat diagram, explain the working principle of H_2-O_2 fuel cell with cell reaction. **(8)**

(ii) Explain how electric power is generated by using wind energy. **(8)**

14. (a) (i) Explain the terms "Dimensional stability" and "Thermal spalling". **(8)**

(ii) Describe the manufacturing process of borosilicate glass. **(8)**

OR

(b) (i) Describe with a neat diagram how Portland cement is manufactured by a wet process. **(8)**

(ii) Write down the properties and uses of

- Waterproof cement
- White cement **(8)**

15. (a) (i) What is meant by Proximate analysis ? **(8)**

(ii) Describe with neat diagram how flue gas is analyzed by Orsat method. **(8)**

OR

(b) (i) With neat diagram, explain the manufacturing of metallurgical coke by Otto-Hoffman method. **(8)**

(ii) Discuss the production and applications of water gas. **(8)**

83

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

Question Paper Code : 57412

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

Second Semester

Electrical and Electronics Engineering

GE6251 – BASIC CIVIL AND MECHANICAL ENGINEERING

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

(Regulations 2013)

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

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. What is a Pedometer ?
2. Mention two advantages of Reinforced concrete.
3. Mention two unique features of a Flemish bond.
4. Define modulus of Rigidity.
5. Differentiate between Thermal and Hydro electric power.
6. What is meant by Greenhouse effect ?
7. Define compression ratio of a IC engine.
8. Mention two disadvantages of a single jet carburettor.
9. Define Relative humidity.
10. Mention two differences between Unitary and Centralised air conditioning systems.

84

PART – B (5 × 16 = 80 Marks)

11.	(a)	(i)	Differentiate between Simple levelling and Differential levelling with sketches.	(8)
		(ii)	State the various properties and uses of concrete.	(8)
			OR	
	(b)	(i)	Brief the quality requirement of brick.	(8)
		(ii)	Explain the necessary qualities of a good stone.	(8)
12.	(a)	(i)	A steel rod of 25 mm diameter and I m length is subjected to an axial pull of 100 kN. Determine the Stress, Strain and Elongation of the rod. Take E = 2×10^5 mm^2.	(8)
		(ii)	Sketch and explain the various parts of a deck bridge.	(8)
			OR	
	(b)	(i)	Compare the brick & stone masonries.	(8)
		(ii)	Explain the various defects that are observed in Plastering.	(8)
13.	(a)	(i)	With a neat sketch, explain the working principle of a closed cycle gas turbine.	(8)
		(ii)	Differentiate between Fire tube and Water tube boilers.	(8)
			OR	
	(b)	(i)	With a neat sketch, explain the working principle of a Cochran Boiler.	(12)
		(ii)	Differentiate between Impulse and Reaction Turbines.	(4)
14.	(a)	(i)	Explain the working principle of a 2 stroke diesel engine.	(8)
		(ii)	Differentiate between Petrol and Diesel engines.	(8)
			OR	
	(b)	(i)	Explain the working principle of a 2 stroke petrol engine.	(12)
		(ii)	What are the main functions of a Carburettor.	(4)
15.	(a)	(i)	Explain the working principle of a Window air conditioner.	(10)
		(ii)	Differentiate between Unitary and Centralized Air-conditioning systems.	(6)
			OR	
	(b)	(i)	Explain the working principle of a domestic refrigerator unit.	(10)
		(ii)	Differentiate between Vapour compression & Vapour absorption systems.	(6)

85

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

Question Paper Code : 81039

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

Second Semester

Electrical and Electronics Engineering

GE 6251 — BASIC CIVIL AND MECHANICAL ENGINEERING

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

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Differentiate between Open traverse and Closed traverse survey.
2. Define Magnetic bearing.
3. Why is Steel a good reinforcing agent in RCC? Give two reasons.
4. What is the use of an Abutment?
5. Mention two disadvantages of Gas turbines.
6. What is the use of a Blow off valve in a boiler?
7. What is the use of a Flywheel in an IC Engine?
8. Mention two advantages of a Tidal power plant.
9. Write any two types of refrigerants
10. Mention two differences between vapour compression and absorption refrigeration systems.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Differentiate between Prismatic and Surveyor compass. (8)

(ii) Explain the various characteristic features of contours with sketches. (8)

Or

(b) (i) Explain the various steps in the manufacturing of bricks. (8)

(ii) With a neat sketch, indicate the parts of a Dumpy level. (8)

86

12. (a) With neat sketches, explain the different types of Shallow foundations used in building constructions. (16)

Or

(b) With neat sketches, explain the different types of Bonds used in brick work. (16)

13. (a) (i) With a neat sketch explain the working principle of a Pressurized water reactor. (8)

(ii) With a neat sketch explain the working principle of a Single stage impulse turbine. (8)

Or

(b) (i) With a neat sketch explain the working principle of a Centrifugal Pump. (8)

(ii) With a neat sketch explain the working principle of a Double acting Pump. (8)

14. (a) (i) With a neat sketch explain the working principle of a Four stroke petrol engine. (12)

(ii) Mention four differences between 2 stroke and 4 stroke engines. (4)

Or

(b) (i) Sketch and explain the principle of a Magneto Ignition system. (12)

(ii) What are the requirements of a good lubricating oil. (4)

15. (a) (i) How does a Vapour compression refrigeration system work? Explain with a sketch. (10)

(ii) Mention the advantages of a Thermo electric cooling system. (6)

Or

(b) (i) With a neat sketch, list the various parts of a Split type air conditioner. (8)

(ii) How does a Vapour absorption refrigeration system work? Explain with a sketch. (8)

57

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

Question Paper Code : 80365

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

Second Semester

Electronics and Communication Engineering

EE 6201 — CIRCUIT THEORY

(Common to Electrical and Electronics Engineering, Electronics and Instrumentation Engineering, Instrumentation and Control Engineering, Biomedical Engineering and Medical Electronics Engineering)

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the limitations of Ohm's law?

2. The equivalent resistance of four resistors joined in parallel is 30 ohms. The current flowing through them are 0.5,0.4,0.6 and 0.1A. Find the value of each resistor.

3. Determine the value of current I_0 of the given figure. 3

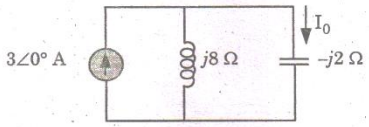

Fig. 3

4. State reciprocity theorem.

5. Draw the frequency response characteristics of parallel resonant circuit.

6. Determine the equivalent inductance of the circuit comprising two inductors in series opposing mode.

7. Determine the Laplace transform of unit step function u(t) and sinusoidal function sin(ωt).

2-8

8. A RLC series circuit has R = 10 ohms and L = 2H. What value of capacitance will make the circuit critically damped?

9. What is a phase sequence of 3 phase system?

10. List any two advantages of three phase system over single-phase system.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Calculate the node voltages of given circuit in fig. 11(a) (i). (8)

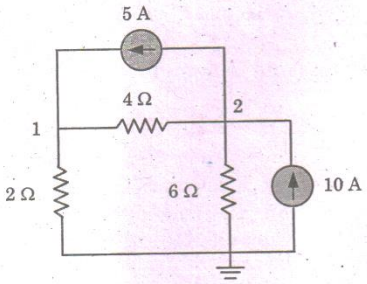

Fig. 11 (a) (i)

(ii) Determine current I_0 for the given circuit in Fig. 11(a) (ii) when $v_s = 12$ V. (8)

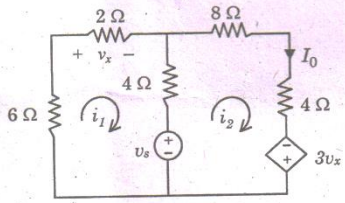

Fig. 11 (a) (ii)

Or

(b) (i) Using mesh analysis for the given fig. 11(b) (i), find the current I_2 and drop across 1Ω resistor. (12)

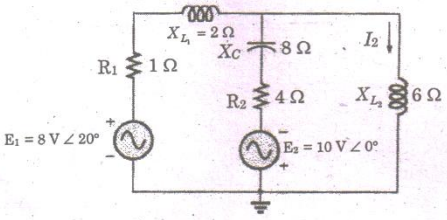

Fig. 11 (b) (i)

(ii) Find the equivalent capacitance C between terminals A and B of fig. 11(b) (ii). (4)

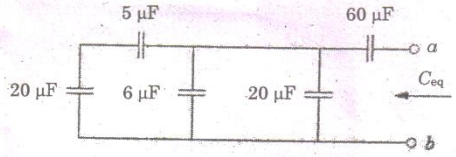

Fig. 11 (b) (ii)

12. (a) (i) Obtain the equivalent resistance R_{ab} of the circuit given in Fig. 12 (a) (i) and calculate the total current i. (8)

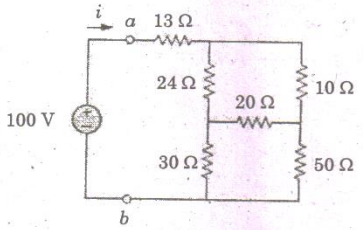

Figure 12 (a) (i)

(ii) Find the value of R_L in fig. 12 (a) (ii) for maximum power to R_L and calculate the maximum power. (8)

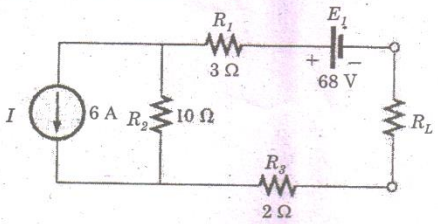

Figure 12 (a) (ii)

Or

(b) Apply superposition theorem to determine current i through 3Ω resistor for the given circuit in fig. 12(b). (16)

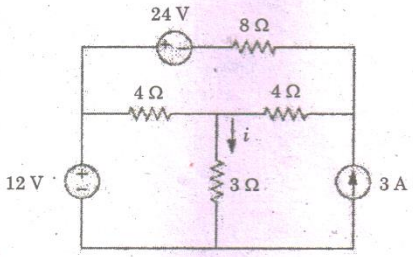

Figure 12 (b)

40

13. (a) For the series resonant circuit of Fig. 13 (a), find I, V_R, V_L, and V_C at resonance. Also, if resonant frequency is 5000Hz, determine bandwidth, Q factor, half power frequencies, and power dissipated in the circuit at resonance and at the half power frequencies. Derive the expression for resonant frequency. (16)

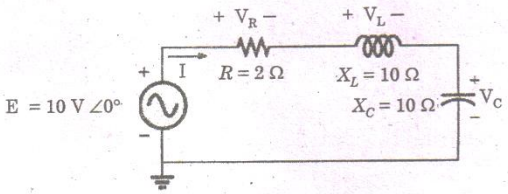

Fig. 13 (a)

Or

(b) (i) Obtain the conductively coupled equivalent circuit for the given circuit in Fig. 13 (b) (i) and Find the voltage drop across 12 Ω resistor. (8)

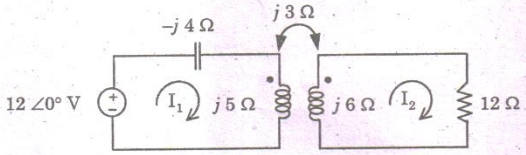

Fig. 13 (b) (i)

(ii) The number of turns in two coupled coils are 500 turns and 1500 turns respectively. When 5 A current flows in coil 1, the total flux in this coil is 0.6×10^{-3} wb and the flux linking in second coil is 0.3×10^{-3} wb. Determine L_1, L_2, M and K. (8)

14. (a) A series R_L circuit with R = 50 Ω and L = 30 H has a constant voltage V = 50 volts applied at t = 0 as shown in fig. 14 (a). Determine the current i, voltage across inductor. Derive the necessary expression and plot the respective curves. (16)

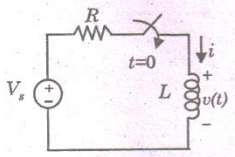

Fig. 14 (a)

Or

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(b) (i) Determine the impedance (Z) parameter of the given two port network in Fig. 14(b) (i). (8)

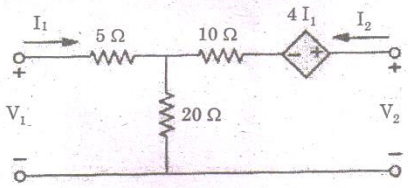

Fig. 14 (b) (i)

(ii) Find the hybrid (h) parameter of the two port network in Fig. 14 (b)(ii). (8)

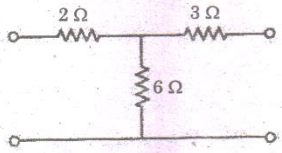

Fig. 14 (b) (ii)

15. (a) (i) For the Δ-Δ system shown in fig. 15 (a) (i), find the phase angles θ_2 and θ_3 for the specified phase sequence. Also, find the phase current and line current in each phase of the load. (8)

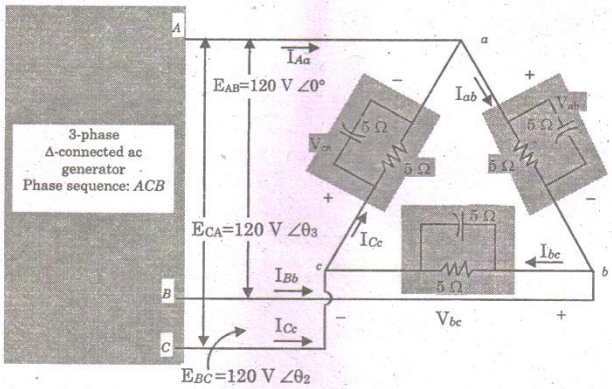

Fig. 15 (a) (i)

(ii) A 3 phase 400V supply is given to balanced star connected load of impedance (8 + 6j) ohms in each branch. Determine line current, power factor and total power. (8)

Or

(b) The two wattmeter produces wattmeter readings P_1 = 1560W and P_2 = 2100W when connected to a delta connected load. If the line voltage is 220V, calculate (i) the per phase average power (ii) total reactive power, (iii) power factor and (iv) the phase impedance. Is the impedance inductive or Capacitive? Justify. (16)

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

Question Paper Code : 57307

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

Second Semester

Electronics and Communication Engineering

EE 6201 – CIRCUIT THEORY

(Common to Electrical and Electronics Engineering, Electronics and Instrumentation Engineering, Instrumentation and Control Engineering, Biomedical Engineering and Medical Electronics Engineering)

(Regulations 2013)

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

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. The resistance of two wires is 25 Ω when connected in series and 6 Ω when connected in parallel. Calculate the resistance of each wire.
2. Distinguish between mesh and loop of a circuit.
3. State reciprocity theorem.
4. What is the condition for maximum power transfer in DC and AC circuits ?
5. Define co-efficient of coupling.
6. In a series RLC circuit, if the value of L and C are 100 mH and 0.1 μF, find the resonance frequency in Hz.
7. In a series RLC circuit, L = 2 H and C = 5 μF. Determine the value of R to give critical damping.
8. Define time constant of RL circuit.
9. A 3 phase 400 V is given to balanced star connected load of impedance 8 + 6j Ω. Calculate line current.
10. List out the advantages of three phase system over single phase system.

PART – B (5 × 16 = 80 Marks)

11. (a) (i) Determine the current I_L in the circuit shown in Fig. 11 (a) (i). **(8)**

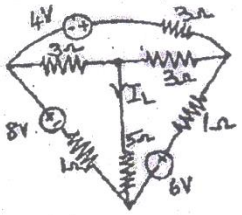

Fig. 11 (a) (i)

(ii) Calculate the voltage across A and B in the circuit shown in Fig. 11 (a) (ii). **(8)**

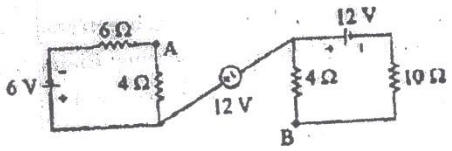

Fig. 11 (a) (ii)

OR

(b) (i) Three loads A, B, C are connected in parallel to a 240 V source. Load A takes 9.6 kW, load B takes 60 A, and load C has a resistance of 4.8 Ω. Calculate R_A and R_B, the total current, total power and equivalent resistance. **(8)**

(ii) For the circuit shown in Fig. 11 (b) (ii), determine the total current and power factor. **(8)**

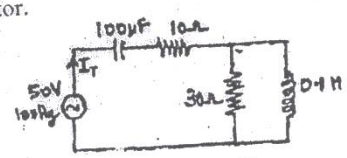

Fig. 11 (b) (ii)

12. (a) Find the voltage across 5 Ω resistor for the circuit shown in Fig. 12 (a) using source transformation technique and verify the results using mesh analysis. **(16)**

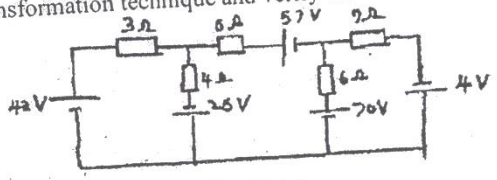

Fig. 12 (a)

OR

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(b) Obtain the Norton's model and find the maximum power that can be transferred to the 100 Ω load resistance, in the circuit shown in Fig. 12 (b) . **(16)**

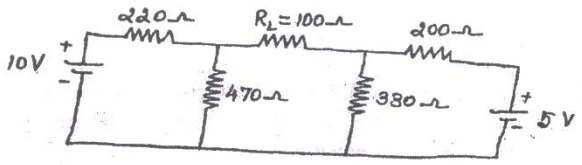

Fig. 12 (b)

13. (a) Determine the resonant frequency, bandwidth and quality factor of the coil for the series resonant circuit considering R = 10 Ω, L = 0.1H and C = 10 μF. Derive the formula used for bandwidth. **(16)**

OR

(b) (i) Derive the expression for equivalent inductance of the parallel resonant circuit as shown in Fig. 13 (b) (i). **(8)**

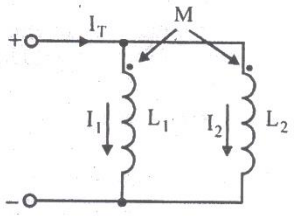

Fig. 13 (b) (i)

(ii) Write the mesh equations and obtain the conductively coupled equivalent circuit for the magnetically coupled circuit shown in Fig. 13 (b) (ii). **(8)**

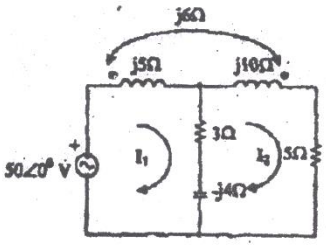

Fig. 13 (b) (ii)

14. (a) A sinusoidal voltage of 10 sin 100 is connected in series with a switch and R = 10 Ω & L = 0.1H. If the switch is closed at t=0, determine the transient current i(t). **(16)**

OR

(b) In the circuit shown in Fig. 14(b). Determine the transient current after switch is closed at time t = 0, given that an initial charge of 100 μC is stored in the capacitor. Derive the necessary equations. **(16)**

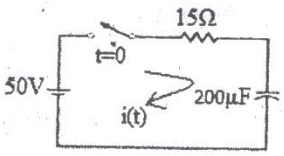

Fig. 14(b)

15. (a) Obtain the readings of two wattmeters connected to a three phase, 3 wire, 120V system feeding a balanced Δ connected load with a load impedance of $12\angle 30°$ Ω. Assume RYB phase sequence. Determine the phase power and compare the total power to the sum of wattmeter readings. **(16)**

OR

(b) (i) If W_1 & W_2 are the reading of two wattmeters which measures power in the three phase balanced system and if $W_1 / W_2 = a$, show that the power factor of the circuit is given by **(8)**

$$\cos\phi = \frac{a+1}{\sqrt[2]{a^2 - a + 1}}$$

(ii) A symmetrical,three phase, three wire 440 V ABC system feeds a balanced Y-connected load with $Z_A = Z_B = Z_C = 10\angle 30°$ Ω obtain the line currents. **(8)**

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 4^{th} Semester and in the software company campus recruitment.
    a. Should complete **C Programming** before joining **2^{nd} Semester**.
    b. Should complete **C++ Programming** before joining **3^{rd} Semester**.
    c. Should complete **JAVA Programming** before joining **4^{th} Semester**. (for the successful completion of object oriented Programming theory paper and laboratory during 4^{th} Semester)
4. An Engineering student from Electrical and Electronics Engineering should complete the **Micro Processor, Micro Controller and Embedded Systems** courses before joining **5^{th} Semester** in order to enhance their Hardware skills. This will be most helpful during their successful completion in Curriculum from 5^{th} to 6^{th} Semester and in the Core company campus recruitment. (for the successful completion of Micro Processor and Micro Controller theory as well as laboratory during 5^{th} Semester and Embedded Systems during 6^{th} Semester)
5. From 6^{th} 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						✓	✓	

GENERAL REMINDERS.

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 5^{th} 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.

Revised

ALL INDIA INSTALLED CAPACITY (IN MW) OF POWER STATIONS

(As on 30.06.2016)
(UTILITIES)

Region	Ownership/ Sector	Modewise breakup							Grand Total
		Thermal				Nuclear	Hydro	RES * (MNRE)	
		Coal	Gas	Diesel	Total				
Northern Region	State	16598.00	2879.20	0.00	19477.20	0.00	7567.55	661.56	27706.31
	Private	17266.00	108.00	0.00	17374.00	0.00	2478.00	8123.48	27975.48
	Central	12000.50	2344.06	0.00	14344.56	1620.00	8266.23	0.00	24230.79
	Sub Total	**45864.50**	**5331.26**	**0.00**	**51195.76**	**1620.00**	**18311.78**	**8785.04**	**79912.58**
Western Region	State	23050.00	2993.82	0.00	26043.82	0.00	5480.50	311.19	31835.51
	Private	36425.00	4288.00	0.00	40713.00	0.00	447.00	15301.81	56461.81
	Central	12898.01	3533.59	0.00	16431.60	1840.00	1520.00	0.00	19791.60
	Sub Total	**72373.01**	**10815.41**	**0.00**	**83188.42**	**1840.00**	**7447.50**	**15613.00**	**108088.91**
Southern Region	State	16882.50	791.98	287.88	17962.36	0.00	11558.03	506.45	30026.84
	Private	8270.00	5322.10	554.96	14147.06	0.00	0.00	18538.23	32685.29
	Central	11890.00	359.58	0.00	12249.58	2320.00	0.00	0.00	14569.58
	Sub Total	**37042.50**	**6473.66**	**842.84**	**44359.00**	**2320.00**	**11558.03**	**19044.68**	**77281.71**
Eastern Region	State	7540.00	100.00	0.00	7640.00	0.00	3168.92	225.11	11034.03
	Private	8731.38	0.00	0.00	8731.38	0.00	195.00	294.28	9220.66
	Central	14351.49	90.00	0.00	14441.49	0.00	925.20	0.00	15366.69
	Sub Total	**30622.87**	**190.00**	**0.00**	**30812.87**	**0.00**	**4289.12**	**519.39**	**35621.38**
North Eastern Region	State	60.00	445.70	36.00	541.70	0.00	382.00	254.25	1177.95
	Private	0.00	24.50	0.00	24.50	0.00	0.00	9.47	33.97
	Central	250.00	1228.10	0.00	1478.10	0.00	860.00	0.00	2338.10
	Sub Total	**310.00**	**1698.30**	**36.00**	**2044.30**	**0.00**	**1242.00**	**263.72**	**3550.02**
Islands	State	0.00	0.00	40.05	40.05	0.00	0.00	5.25	45.30
	Private	0.00	0.00	0.00	0.00	0.00	0.00	5.85	5.85
	Central	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Sub Total	**0.00**	**0.00**	**40.05**	**40.05**	**0.00**	**0.00**	**11.10**	**51.15**
ALL INDIA	State	64130.50	7210.70	363.93	71705.13	0.00	28157.00	1963.80	101825.93
	Private	70692.38	9742.60	554.96	80989.94	0.00	3120.00	42273.12	126383.06
	Central	51390.00	7555.33	0.00	58945.33	5780.00	11571.43	0.00	76296.76
	Total	**186212.88**	**24508.63**	**918.89**	**211640.40**	**5780.00**	**42848.43**	**44236.92**	**304505.75**

Figures at decimal may not tally due to rounding off

Abbreviation: SHP=Small Hydro Project (≤ 25 MW), BP=Biomass Power, U&I=Urban & Industrial Waste Power, RES=Renewable Energy Sources

Note : - 1.RES include SHP, BP, U&I, Solar and Wind Energy. Installed capacity in respect of RES (MNRE) as on 30.06.2016 (As per latest information available with MNRE)

***Break up of RES all India as on 30.06.2016 is given below (in MW) :**

Small Hydro Power	Wind Power	Bio-Power		Solar Power	Total Capacity
		BM Power/Cogen.	Waste to Energy		
4304.27	27151.40	4860.83	115.08	7805.34	44236.92

2. Installed capacity of Andhra Pradesh has been bifurcated in the ratio of 53.89 and 46.11 among Telangana and New Andhra Pradeh respectively. Except the installed capacity of Thamminapatnam (300 MW), Simhapuri (450 MW) and Tanir Bhavi (220 MW) are shown in the state of New Andhra Pradesh.

3. Pragati -III CCPP share has been corrected by reducing 250 MW from Delhi and adding 125 MW in Punjab & Haryana each.

4. Koldam (800 MW, four units) shares have been revised as per MoP order No. 5/7/2013-Th.II (Vol. I) dated 10.02.2016

5. Bhavnagar TPP (Lignite) U-I of 250 MW has been added in Gujarat State Sector

6. Jegurupadu CCPP Phase-I of 235.4 MW has been added to state sector of Andhra Pradesh and the same capacity has been deducted from Private sector of Telangana and Andhra Pradesh in the ratio of 53.86 and 46.11.

7. Unit-1 of 30 MW of Chakabura TPS of M/s ACB Ltd. has been removed from the installed capacity of Chattisgarh Private Sector because it is being considered as Captive.

8. Earlier circulated installed capacity was 303118.21 MW wchich includes RES installed capacity 42849.38 MW as on 31.03.2016. Now MNRE has provided the RES capacity as on 31.06.2016 as 44236.92 MW, therefore All India installed capacity as on 30.04.2015 has been revised to 304505.75 MW

Revised

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

NORTHERN REGION

INCLUDING ALLOCATED SHARES IN JOINT & CENTRAL SECTOR UTILITIES

(As on 30.06.2016)

State	Ownership/ Sector	Modewise breakup							Grand Total
		Thermal				Nuclear	Hydro (Renewable)	RES (MNRE)	
		Coal	Gas	Diesel	Total				
Delhi	State	135.00	1800.40	0.00	1935.40	0.00	0.00	0.00	1935.40
	Private	445.50	108.00	0.00	553.50	0.00	0.00	39.87	593.37
	Central	4421.37	207.61	0.00	4628.98	122.08	762.64	0.00	5513.70
	Sub-Total	**5001.87**	**2116.01**	**0.00**	**7117.88**	**122.08**	**762.64**	**39.87**	**8042.47**
Haryana	State	2720.00	150.00	0.00	2870.00	0.00	884.51	59.30	3813.81
	Private	2165.50	0.00	0.00	2165.50	0.00	0.00	74.89	2240.39
	Central	1202.03	535.29	0.00	1737.32	109.16	610.13	0.00	2456.61
	Sub-Total	**6087.53**	**685.29**	**0.00**	**6772.82**	**109.16**	**1494.64**	**134.19**	**8510.81**
Himachal Pradesh	State	0.00	0.00	0.00	0.00	0.00	458.60	256.11	714.71
	Private	0.00	0.00	0.00	0.00	0.00	1748.00	537.90	2285.90
	Central*	152.02	61.88	0.00	213.90	34.08	1288.94	0.00	1536.92
	Sub-Total	**152.02**	**61.88**	**0.00**	**213.90**	**34.08**	**3495.54**	**794.01**	**4537.53**
Jammu & Kashmir	State	0.00	175.00	0.00	175.00	0.00	1230.00	106.53	1511.53
	Private	0.00	0.00	0.00	0.00	0.00	0.00	51.00	51.00
	Central	329.32	129.14	0.00	458.46	77.00	1044.35	0.00	1579.81
	Sub-Total	**329.32**	**304.14**	**0.00**	**633.46**	**77.00**	**2274.35**	**157.53**	**3142.34**
Punjab	State	2630.00	150.00	0.00	2780.00	0.00	2230.23	127.80	5138.03
	Private	5014.00	0.00	0.00	5014.00	0.00	0.00	729.55	5743.55
	Central	660.88	263.92	0.00	924.80	208.04	921.65	0.00	2054.49
	Sub-Total	**8304.88**	**413.92**	**0.00**	**8718.80**	**208.04**	**3151.88**	**857.35**	**12936.07**
Rajasthan	State	5190.00	603.80	0.00	5793.80	0.00	987.96	23.85	6805.61
	Private	3196.00	0.00	0.00	3196.00	0.00	0.00	5401.35	8597.35
	Central	1014.72	221.23	0.00	1235.95	573.00	741.53	0.00	2550.48
	Sub-Total	**9400.72**	**825.03**	**0.00**	**10225.75**	**573.00**	**1729.49**	**5425.20**	**17953.44**
Uttar Pradesh	State	5923.00	0.00	0.00	5923.00	0.00	524.10	25.10	6472.20
	Private	6346.00	0.00	0.00	6346.00	0.00	0.00	1018.50	7364.50
	Central	2909.95	549.97	0.00	3459.92	335.72	1660.65	0.00	5456.29
	Sub-Total	**15178.95**	**549.97**	**0.00**	**15728.92**	**335.72**	**2184.75**	**1043.60**	**19292.99**
Uttrakhnad	State	0.00	0.00	0.00	0.00	0.00	1252.15	62.87	1315.02
	Private	99.00	0.00	0.00	99.00	0.00	730.00	263.61	1092.61
	Central	300.50	69.35	0.00	369.85	22.28	469.24	0.00	861.37
	Sub-Total	**399.50**	**69.35**	**0.00**	**468.85**	**22.28**	**2451.39**	**326.48**	**3269.00**
Chandigarh	State	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Private	0.00	0.00	0.00	0.00	0.00	0.00	6.81	6.81
	Central	32.54	15.32	0.00	47.86	8.84	62.74	0.00	119.44
	Sub-Total	**32.54**	**15.32**	**0.00**	**47.86**	**8.84**	**62.74**	**6.81**	**126.25**
Central - Unallocated		977.19	290.35	0.00	1267.54	129.80	704.36	0.00	2101.70
Total (Northern Region)	State	16598.00	2879.20	0.00	19477.20	0.00	7567.55	661.56	27706.31
	Private	17266.00	108.00	0.00	17374.00	0.00	2478.00	8123.48	27975.48
	Central	12000.50	2344.06	0.00	14344.56	1620.00	8266.23	0.00	24230.79
	Grand Total	**45864.50**	**5331.26**	**0.00**	**51195.76**	**1620.00**	**18311.78**	**8785.04**	**79912.58**

Revised

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

WESTERN REGION

INCLUDING ALLOCATED SHARES IN JOINT & CENTRAL SECTOR UTILITIES

(As on 30.06.2016)

State	Ownership/ Sector	Modewise breakup							Grand Total
		Thermal				Nuclear	Hydro (Renewable)	RES (MNRE)	
		Coal	Gas	Diesel	Total				
Goa	State	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.05
	Private	0.00	48.00	0.00	48.00	0.00	0.00	0.00	48.00
	Central	338.60	0.00	0.00	338.60	25.80	0.00	0.00	364.40
	Sub-Total	**338.60**	**48.00**	**0.00**	**386.60**	**25.80**	**0.00**	**0.05**	**412.45**
Daman & Diu	State	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Private	0.00	0.00	0.00	0.00	0.00	0.00	4.00	4.00
	Central	43.38	4.20	0.00	47.58	7.38	0.00	0.00	54.96
	Sub-Total	**43.38**	**4.20**	**0.00**	**47.58**	**7.38**	**0.00**	**4.00**	**58.96**
Gujarat	State	5220.00	2321.82	0.00	7541.82	0.00	772.00	8.00	8321.82
	Private	8642.00	4060.00	0.00	12702.00	0.00	0.00	5292.72	17994.72
	Central	2888.62	424.27	0.00	3312.89	559.32	0.00	0.00	3872.21
	Sub-Total	**16750.62**	**6806.09**	**0.00**	**23556.71**	**559.32**	**772.00**	**5300.72**	**30188.75**
Madhya Pradesh	State	4080.00	0.00	0.00	4080.00	0.00	1703.66	83.96	5867.62
	Private	5389.00	0.00	0.00	5389.00	0.00	0.00	3120.07	8509.07
	Central	2490.05	257.18	0.00	2747.23	273.24	1520.00	0.00	4540.47
	Sub-Total	**11959.05**	**257.18**	**0.00**	**12216.23**	**273.24**	**3223.66**	**3204.03**	**18917.16**
Chhattisgarh	State	2780.00	0.00	0.00	2780.00	0.00	120.00	11.05	2911.05
	Private	10598.00	0.00	0.00	10598.00	0.00	0.00	438.63	11036.63
	Central	1574.54	0.00	0.00	1574.54	47.52	0.00	0.00	1622.06
	Sub-Total	**14952.54**	**0.00**	**0.00**	**14952.54**	**47.52**	**120.00**	**449.68**	**15569.74**
Maharashtra	State	10970.00	672.00	0.00	11642.00	0.00	2884.84	208.13	14734.97
	Private	11796.00	180.00	0.00	11976.00	0.00	447.00	6446.39	18869.39
	Central	3712.26	2623.93	0.00	6336.19	690.14	0.00	0.00	7026.33
	Sub-Total	**26478.26**	**3475.93**	**0.00**	**29954.19**	**690.14**	**3331.84**	**6654.52**	**40630.69**
Dadra & Nagar Naveli	State	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Private	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Central	54.22	27.10	0.00	81.32	8.46	0.00	0.00	89.78
	Sub-Total	**54.22**	**27.10**	**0.00**	**81.32**	**8.46**	**0.00**	**0.00**	**89.78**
Central - Unallocated		1796.35	196.91	0.00	1993.26	228.14	0.00	0.00	2221.40
Total (Western Region)	State	23050.00	2993.82	0.00	26043.82	0.00	5480.50	311.19	31835.51
	Private	36425.00	4288.00	0.00	40713.00	0.00	447.00	15301.81	56461.81
	Central	12898.01	3533.59	0.00	16431.60	1840.00	1520.00	0.00	19791.60
	Grand Tota	**72373.01**	**10815.41**	**0.00**	**83188.42**	**1840.00**	**7447.50**	**15613.00**	**108088.91**

Revised

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

SOUTHERN REGION

INCLUDING ALLOCATED SHARES IN JOINT & CENTRAL SECTOR UTILITIES

(As on 30.06.2016)

State	Ownership/ Sector	Modewise breakup							Grand Total
		Thermal				Nuclear	Hydro (Renewable)	RES (MNRE)	
		Coal	Gas	Diesel	Total				
Andhra Pradesh	State	3085.91	235.40	0.00	3321.31	0.00	1758.87	89.50	5169.68
	Private	2990.00	3074.11	16.97	6081.08	0.00	0.00	2911.71	8992.79
	Central	1473.30	0.00	0.00	1473.30	127.16	0.00	0.00	1600.46
	Sub-Total	**7549.21**	**3309.51**	**16.97**	**10875.69**	**127.16**	**1758.87**	**3001.21**	**15762.94**
Telangana	State	4806.59	0.00	0.00	4806.59	0.00	2135.66	0.00	6942.25
	Private	270.00	1570.89	19.83	1860.72	0.00	0.00	895.29	2756.01
	Central	1721.88	0.00	0.00	1721.88	148.62	0.00	0.00	1870.50
	Sub-Total	**6798.47**	**1570.89**	**19.83**	**8389.19**	**148.62**	**2135.66**	**895.29**	**11568.76**
Karnataka	State	4220.00	0.00	127.92	4347.92	0.00	3599.80	155.33	8103.05
	Private	2060.00	0.00	106.50	2166.50	0.00	0.00	4960.05	7126.55
	Central	1628.46	0.00	0.00	1628.46	475.86	0.00	0.00	2104.32
	Sub-Total	**7908.46**	**0.00**	**234.42**	**8142.88**	**475.86**	**3599.80**	**5115.38**	**17333.92**
Kerala	State	0.00	0.00	159.96	159.96	0.00	1881.50	138.92	2180.38
	Private	0.00	174.00	0.00	174.00	0.00	0.00	116.55	290.55
	Central	1038.69	359.58	0.00	1398.27	228.60	0.00	0.00	1626.87
	Sub-Total	**1038.69**	**533.58**	**159.96**	**1732.23**	**228.60**	**1881.50**	**255.47**	**4097.80**
Tamil Nadu	State	4770.00	524.08	0.00	5294.08	0.00	2182.20	122.70	7598.98
	Private	2950.00	503.10	411.66	3864.76	0.00	0.00	9654.60	13519.36
	Central	4155.10	0.00	0.00	4155.10	986.50	0.00	0.00	5141.60
	Sub-Total	**11875.10**	**1027.18**	**411.66**	**13313.94**	**986.50**	**2182.20**	**9777.30**	**26259.94**
NLC	State	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Private	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Central	100.17	0.00	0.00	100.17	0.00	0.00	0.00	100.17
	Sub-Total	**100.17**	**0.00**	**0.00**	**100.17**	**0.00**	**0.00**	**0.00**	**100.17**
Puducherry	State	0.00	32.50	0.00	32.50	0.00	0.00	0.00	32.50
	Private	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.03
	Central	249.32	0.00	0.00	249.32	52.78	0.00	0.00	302.10
	Sub-Total	**249.32**	**32.50**	**0.00**	**281.82**	**52.78**	**0.00**	**0.03**	**334.63**
Central - Unallocated		1523.08	0.00	0.00	1523.08	300.48	0.00	0.00	1823.56
Total (Southern Region)	State	16882.50	791.98	287.88	17962.36	0.00	11558.03	506.45	30026.84
	Private	8270.00	5322.10	554.96	14147.06	0.00	0.00	18538.23	32685.29
	Central	11890.00	359.58	0.00	12249.58	2320.00	0.00	0.00	14569.58
	Grand Tota	**37042.50**	**6473.66**	**842.84**	**44359.00**	**2320.00**	**11558.03**	**19044.68**	**77281.71**

Revised

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

EASTERN REGION

INCLUDING ALLOCATED SHARES IN JOINT & CENTRAL SECTOR UTILITIES

(As on 30.06.2016)

State	Ownership/ Sector	Modewise breakup							Grand Total
		Thermal				Nuclear	Hydro (Renewable)	RES (MNRE)	
		Coal	Gas	Diesel	Total				
Bihar	State	210.00	0.00	0.00	210.00	0.00	0.00	70.70	280.70
	Private	0.00	0.00	0.00	0.00	0.00	0.00	88.52	88.52
	Central	2531.24	0.00	0.00	2531.24	0.00	129.43	0.00	2660.67
	Sub-Total	**2741.24**	**0.00**	**0.00**	**2741.24**	**0.00**	**129.43**	**159.22**	**3029.89**
Jharkhand	State	1190.00	0.00	0.00	1190.00	0.00	130.00	4.05	1324.05
	Private	900.00	0.00	0.00	900.00	0.00	0.00	16.19	916.19
	Central	314.93	0.00	0.00	314.93	0.00	70.93	0.00	385.86
	Sub-Total	**2404.93**	**0.00**	**0.00**	**2404.93**	**0.00**	**200.93**	**20.24**	**2626.10**
West Bengal	State	5720.00	100.00	0.00	5820.00	0.00	977.00	91.95	6888.95
	Private	1781.38	0.00	0.00	1781.38	0.00	0.00	44.32	1825.70
	Central	922.45	0.00	0.00	922.45	0.00	351.30	0.00	1273.75
	Sub-Total	**8423.83**	**100.00**	**0.00**	**8523.83**	**0.00**	**1328.30**	**136.27**	**9988.40**
DVC	State	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Private	1050.00	0.00	0.00	1050.00	0.00	0.00	0.00	1050.00
	Central	7210.66	90.00	0.00	7300.66	0.00	193.26	0.00	7493.92
	Sub-Total	**8260.66**	**90.00**	**0.00**	**8350.66**	**0.00**	**193.26**	**0.00**	**8543.92**
Odisha	State	420.00	0.00	0.00	420.00	0.00	2061.92	6.30	2488.22
	Private	5000.00	0.00	0.00	5000.00	0.00	0.00	145.25	5145.25
	Central	1683.04	0.00	0.00	1683.04	0.00	105.01	0.00	1788.05
	Sub-Total	**7103.04**	**0.00**	**0.00**	**7103.04**	**0.00**	**2166.93**	**151.55**	**9421.52**
Sikkim	State	0.00	0.00	0.00	0.00	0.00	0.00	52.11	52.11
	Private	0.00	0.00	0.00	0.00	0.00	195.00	0.00	195.00
	Central	92.10	0.00	0.00	92.10	0.00	75.27	0.00	167.37
	Sub-Total	**92.10**	**0.00**	**0.00**	**92.10**	**0.00**	**270.27**	**52.11**	**414.48**
Central - Unallocated		1597.07	0.00	0.00	1597.07	0.00	0.00	0.00	1597.07
Total (Eastern Region)	State	7540.00	100.00	0.00	7640.00	0.00	3168.92	225.11	11034.03
	Private	8731.38	0.00	0.00	8731.38	0.00	195.00	294.28	9220.66
	Central	14351.49	90.00	0.00	14441.49	0.00	925.20	0.00	15366.69
	Grand Tota	**30622.87**	**190.00**	**0.00**	**30812.87**	**0.00**	**4289.12**	**519.39**	**35621.38**

Revised

INSTALLED CAPACITY (IN MW) OF POWER UTILITIES IN THE STATES/UTS LOCATED IN NORTH-EASTERN REGION

INCLUDING ALLOCATED SHARES IN JOINT & CENTRAL SECTOR UTILITIES

(As on 30.06.2016)

State	Ownership/ Sector	Modewise breakup							Grand Total
		Thermal				Nuclear	Hydro (Renewable)	RES (MNRE)	
		Coal	Gas	Diesel	Total				
Assam	State	60.00	276.20	0.00	336.20	0.00	100.00	30.01	466.21
	Private	0.00	24.50	0.00	24.50	0.00	0.00	4.10	28.60
	Central	127.00	417.92	0.00	544.92	**0.00**	329.72	0.00	874.64
	Sub-Total	**187.00**	**718.62**	**0.00**	**905.62**	**0.00**	**429.72**	**34.11**	**1369.45**
Arunachal Pradesh	State	0.00	0.00	0.00	0.00	0.00	0.00	104.61	104.61
	Private	0.00	0.00	0.00	0.00	0.00	0.00	0.27	0.27
	Central	12.35	43.06	0.00	55.41	0.00	97.57	0.00	152.98
	Sub-Total	**12.35**	**43.06**	**0.00**	**55.41**	**0.00**	**97.57**	**104.88**	**257.86**
Meghalaya	State	0.00	0.00	0.00	0.00	0.00	282.00	31.03	313.03
	Private	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Central	17.70	105.14	0.00	122.84	0.00	74.58	0.00	197.42
	Sub-Total	**17.70**	**105.14**	**0.00**	**122.84**	**0.00**	**356.58**	**31.03**	**510.45**
Tripura	State	0.00	169.50	0.00	169.50	0.00	0.00	16.01	185.51
	Private	0.00	0.00	0.00	0.00	0.00	0.00	5.00	5.00
	Central	18.70	404.92	0.00	423.62	0.00	62.37	0.00	485.99
	Sub-Total	**18.70**	**574.42**	**0.00**	**593.12**	**0.00**	**62.37**	**21.01**	**676.50**
Manipur	State	0.00	0.00	36.00	36.00	0.00	0.00	5.45	41.45
	Private	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Central	15.70	67.98	0.00	83.68	0.00	80.98	0.00	164.66
	Sub-Total	**15.70**	**67.98**	**36.00**	**119.68**	**0.00**	**80.98**	**5.45**	**206.11**
Nagaland	State	0.00	0.00	0.00	0.00	0.00	0.00	30.67	30.67
	Private	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Central	10.70	46.35	0.00	57.05	0.00	53.32	0.00	110.37
	Sub-Total	**10.70**	**46.35**	**0.00**	**57.05**	**0.00**	**53.32**	**30.67**	**141.04**
Mizoram	State	0.00	0.00	0.00	0.00	0.00	0.00	36.47	36.47
	Private	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10
	Central	10.35	38.29	0.00	48.64	0.00	34.31	0.00	82.95
	Sub-Total	**10.35**	**38.29**	**0.00**	**48.64**	**0.00**	**34.31**	**36.57**	**119.52**
Central - Unallocated		37.50	104.44	0.00	141.94	0.00	127.15	0.00	269.09
Total (North-Eastern Region)	State	60.00	445.70	36.00	541.70	0.00	382.00	254.25	1177.95
	Private	0.00	24.50	0.00	24.50	0.00	0.00	9.47	33.97
	Central	250.00	1228.10	0.00	1478.10	0.00	860.00	0.00	2338.10
	Grand Tota	**310.00**	**1698.30**	**36.00**	**2044.30**	**0.00**	**1242.00**	**263.72**	**3550.02**

Revised

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

ISLANDS

INCLUDING ALLOCATED SHARES IN JOINT & CENTRAL SECTOR UTILITIES

(As on 30.06.2016)

State	Ownership/ Sector	Modewise breakup							Grand Total
		Thermal				Nuclear	Hydro (Renewable)	RES (MNRE)	
		Coal	Gas	Diesel	Total				
Andaman & Nicobar	State	0.00	0.00	40.05	40.05	0.00	0.00	5.25	45.30
	Private	0.00	0.00	0.00	0.00	0.00	0.00	5.10	5.10
	Central	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Sub-Total	**0.00**	**0.00**	**40.05**	**40.05**	**0.00**	**0.00**	**10.35**	**50.40**
lakshadweep	State	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Private	0.00	0.00	0.00	0.00	0.00	0.00	0.75	0.75
	Central	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Sub-Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.75**	**0.75**
Total (Islands)	State	0.00	0.00	40.05	40.05	0.00	0.00	5.25	45.30
	Private	0.00	0.00	0.00	0.00	0.00	0.00	5.85	5.85
	Central	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Grand Tota	**0.00**	**0.00**	**40.05**	**40.05**	**0.00**	**0.00**	**11.10**	**51.15**

Phone : 044-22501211/0252
Fax : 044-22501460
Email : atichn@vsnl.com, atichn@yahoo.com
Url : www.atichennai.org.in

GOVERNMENT OF INDIA

MINISTRY OF SKILL DEVELOPMENT AND ENTERPRENEURSHIP
DIRECTORATE GENERAL OF TRAINING

ADVANCED TRAINING INSTITUTE

(AN ISO 29990 : CERTIFIED)

Guindy, CHENNAI, Tamilnadu

Annual Training calendar 2016 – 2017

(short term skill training programme)

	Course Code	Course Title	Duration (Week)	Date	
				From	To
GROUP:1	**ELECTRICAL CONTROL MAINTENANCE**				
	01.01	Protective Relays , Circuit Breakers, & Switch Gear Protection	01	04-04-2016	08-04-2016
				09-05-2016	13-05-2016
				20-06-2016	24-06-2016
				08-08-2016	12-08-2016
				12-09-2016	16-09-2016
				24-10-2016	28-10-2016
				19-12-2016	23-12-2016
				06-02-2017	10-02-2016
				13-03-2017	17-03-2017
	01.02	Operation and Maint. Of Power Transformers	01	11-04-2016	15-04-2016
				16-05-2016	20-05-2016
				27-06-2016	01-07-2016
				01-08-2016	05-08-2016
				29-08-2016	02-09-2016
				31-10-2016	04-11-2016
				05-12-2016	09-12-2016
				26-12-2016	30-12-2016
				13-02-2017	17-02-2017
				20-03-2017	24-03-2017
	01.03	Trouble shooting & Maintenance of Electric Motors	01	25-04-2016	29-04-2016
				23-05-2016	27-05-2016
				11-07-2016	15-07-2016
				19-09-2016	23-09-2016
				17-10-2016	21-10-2016
				07-11-2016	11-11-2016
				02-01-2017	06-01-2017
				20-02-2017	24-02-2017
	01.04	Operation & Control of Industrial AC/DC Motors	01	02-05-2016	06-05-2016
				30-05-2016	03-06-2016
				13-06-2016	17-06-2016
				18-07-2016	22-07-2016
				26-09-2016	30-09-2016
				21-11-2016	25-11-2016
				09-01-2017	13-01-2017
				27-02-2017	03-03-2017
	01.05	Electrical Safety at Work Place and First Aid	01	02-05-2016	06-05-2016
				06-06-2016	10-06-2016
				25-07-2016	29-07-2016
				03-10-2016	07-10-2016
				28-11-2016	02-12-2016
				16-01-2017	20-01-2017
				06-03-2017	10-03-2017

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GROUP:1	**ELECTRONIC CONTROL MAINTENANCE**			
Course Code	Course Title	Duration (Week)	**Date** From	To
02.01	Maintenance and Servicing of SMPS Inverter & UPS	02	11-07-2016 02-01-2017	22-07-2016 13-01-2017
02.02	Power Electronics and its Industrial Applications	02	04-04-2016 26-09-2016 27-02-2017	15-04-2016 07-10-2016 10-03-2017
02.03	Industrial Drives & Automation using Siemens PLC	02	16-05-2016 08-08-2016 23-01-2017	27-05-2016 19-08-2016 03-02-2017
02.04	SIEMENS S7 400 PLC Step – 7 (Level-1)	01	25-04-2016 29-08-2016 06-02-2017	29-04-2016 02-09-2016 10-02-2017
02.05	SIEMENS S7 400 PLC WinCC SCADA (Level- 2)	01	02-05-2016 05-09-2016 13-02-2017	06-05-2016 09-09-2016 17-02-2017
02.06	SIEMENS S7 400 PLC TIA Portal (Level- 1)	01	16-05-2016 27-06-2016 08-08-2016 28-11-2016 23-01-2017	20-05-2016 01-07-2016 12-08-2016 02-12-2016 27-01-2017
02.07	SIEMENS S7 400 PLC WinCC Flexible HMI (Level- 2)	01	25-07-2016 05-12-2016	29-07-2016 09-12-2016
02.08	Analog and PID Control SIEMEN'S PLC (Level-3)	01	22-08-2016 17-10-2016	26-08-2016 21-10-2016
02.09	SIEMENS PLC Trouble Shooting & Maintenance	01	30-05-2016 24-10-2016	03-06-2016 28-10-2016
02.10	Embedded Systems Programming & Applications (PIC 16F877A)	01	06-06-2016 19-09-2016 07-11-2016 13-03-2017	10-06-2016 23-09-2016 11-11-2016 17-03-2017
02.11	ARM 7 Embedded Systems Programming and Applications	01	13-06-2016 14-11-2016 20-03-2017	17-06-2016 18-11-2016 24-03-2017

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GROUP:1	**PROCESS CONTROL INSTRUMENTATION**			
Course Code	Course Title	Duration (Week)	**Date**	
			From	To
03.01	Allen Bradley PLC SLC 500 Programming & Applications	01	04-04-2016	08-04-2016
			02-05-2016	06-05-2016
			30-05-2016	03-06-2016
			27-06-2016	01-07-2016
			29-08-2016	02-09-2016
			03-10-2016	07-10-2016
			31-10-2016	04-11-2016
			02-01-2017	06-01-2017
03.02	Testing and Calibration of Industrial Instruments (Pressure and Temperature)	01	23-05-2016	27-05-2016
			05-09-2016	09-09-2016
			24-10-2016	28-10-2016
			14-11-2016	18-11-2016
			05-12-2016	09-12-2016
			26-12-2016	30-12-2016
			06-02-2017	10-02-2017
			20-03-2017	24-02-2017
03.03	Process Automation using AB PLC & SCADA	02	11-04-2016	22-04-2016
			13-06-2016	24-06-2016
			12-09-2016	23-09-2016
			10-10-2016	21-10-2016
			12-12-2016	23-12-2016
			13-02-2017	24-02-2017
03.04	Virtual Instrumentation and Remote Data Acquisition using Vee Pro	01	02-05-2016	06-05-2016
			06-06-2016	10-06-2016
			16-01-2017	20-01-2017
			13-03-2017	17-03-2017
03.05	Mixed Signal Processing using PSOC	01	16-05-2016	20-05-2016
			18-07-2016	22-07-2016
			15-08-2016	19-08-2016
			30-01-2017	03-02-2017
03.06	GE Fanuc PLC Programming and Applications	01	25-07-2016	29-07-2016
			26-09-2016	30-09-2016
			09-01-2017	13-01-2017
03.07	Embedded Controller Programming and Application (89C51)	01	25-04-2016	29-04-2016
			09-05-2016	13-05-2016
			11-07-2016	15-07-2016
			07-11-2016	11-11-2016
03.08	Basic Industrial Instruments & Automation	02	01-08-2016	12-08-2016
			21-11-2016	02-12-2016
			27-02-2017	10-03-2017

List of PSUs through GATE Exam

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

Lists of TPO 10 software companies to offer jobs in India

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

Lists of TOP 10 core companies to offer Electrical jobs

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

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

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

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

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

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

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

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

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

Crompton Greaves is a part of Avantha Group which is headquartered in Mumbai. CGL deals in manufacturing, marketing and designing of power transmission and generation related products.

CGL has manufacturing units in Canada, France, Hungary, UK, US, Indonesia, Ireland, India and Belgium.

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

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

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

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

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

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

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

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

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

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

List of Core Companies to offer Electrical Jobs in India

Types of Electrical Core Companies

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

Electrical motors and Generators

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

Consultancy (Electrical Engineering)

1. APJ Projects http://www.apjprojects.com
2. Consolidated Consultants and Engineers Pvt. Ltd http://www.consolidatedconsultants.com
3. DSON Enterprises http://www.dsonenterprises.com
4. Eltech Engineers http://www.eltechindia.com/
5. John Mech-El Technologies (P) Ltd http://www.johnmech-el.com/
6. Mandvi Electric Works http://www.bicserve.com/

7. Miraj Instrumentation Services http://www.mirajinstrumentation.com
8. PG Associates http://www.engineeringconsultant.in
9. Power Gem Engineers - Consultants in Power Generation. http://www.powergem.com/
10. Secon Engineers http://www.seconindia.com
11. Shanti Enterprises Electricals Limited http://www.shantielectricals.com
12. Shashi Electricals http://www.shashielectricals.com
13. SK Systems http://www.sksystem.com
14. Tata Consulting Engineers http://www.tce.co.in
15. Nutronics India http://www.nutronicsindia.com/

Electrical appliances

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

Electrical components companies

1. Ace Bimetalliks India Pvt. Ltd. http:// www.aceelectricals.com
2. Aditron India Pvt. Ltd. (Engineering Division) http://www.aiplen.com
3. Admir Ovens http://www.admir.com
4. Arvind Anticor Ltd http://www.picklingplant.com
5. Asiatic Electronic Industries. http://www.asiatic-india.com/
6. Axis Electrical Components India Pvt. Ltd. http://www.axis-india.com
7. Balar Marketing Pvt. Ltd http://www.allelectricalproducts.com/
8. Bhartia Industries Limited http://www.bchindia.com
9. Brass Copper & Alloy (I) Ltd. http://www.hexworldwide.com
10. Brightech Valves and Controls Pvt. Ltd. http://www.brightechvalves.com

11. Caltech Engineering Services http://www.caltechindia.com
12. Color Design India http://www.colordesigntech.com/
13. Consult Techniques (I) Pvt. Ltd http://www.consulttechnique.com/
14. Deki Electronics Ltd. http://www.dekielectronics.com
15. Elpro International Limited http://www.elproindia.com/
16. Elymer http://www.elymer.com
17. E S Electronics (India) Pvt. Ltd http://www.energysaversindia.com/
18. Finetech Engineering Corporation http://www.finetechindia.com
19. Gayatri Control, Ahmedabad http://www.gayatricontrol.com/
20. Gemscab Industries Ltd http://www.gemscab.com/
21. Hallmark Electronics http://www.hallmarkelect.com/
22. India International House Ltd http://www.builderhardware.com/
23. Jaykrishna magnetics pvt.ltd http://www.jkmagnetics.com
24. Leotech Group http://www.leotechindia.com/
25. Maxx Mobile Phone Accessories Pvt. Ltd http://www.maxmobile.co.in
26. Mehta Engineering Enterprise http://www.mehtaswitch.com
27. Mehta Tubes Ltd http://www.mehta-group.com/
28. Mellcon Engineers http://www.mellcon.com
29. Micromot Controls http://www.micromotcontrols.com
30. Muskaan Engineers http://www.electricitysaver.com/
31. Neelam Import Pvt. Ltd. http://www.cellking.org
32. Onload Gears http://www.onloadgears.com/
33. Orton Engineering Pvt. Ltd, Thane http://www.ortonengineering.com/
34. Persang Alloy Industries http://www.webmasterindia.com/persangalloy
35. PMT Engineers http://www.pmtengineers.com
36. Powercap Systems (Madras) Pvt. Ltd http://www.transformersindia.com/
37. Powertek Equipment Company http://www.powertekindia.com/
38. Pragati Electrocom Pvt. Ltd http://www.pragatielectrocom.com/
39. Pran Electronics Pvt. Ltd. http://www.pranelectronics.com
40. Precicraft Components India Pvt. Ltd http://www.precicraft.com/
41. Prima Automation India Pvt. Ltd http://www.prima-automation.com/
42. Rittal India Pvt Ltd http://www.rittal-india.com
43. Sanghi Yantra Udyog http://www.skyuindia.com/
44. SKN - Bentex Group of Companies. http://www.sknbentex.com/
45. South India Industrial Suppliers http://siis-india.com/bus_bar_support.html
46. Square Automation Pvt. Ltd http://www.squareautomation.com/
47. Sudhir Switchgears http://www.sudhirswitchgears.com
48. Syntron Controls http://www.syntron-controls.com
49. Torque Master Tools Pvt. Ltd http://www.torquemasterindia.com/
50. United Core http://www.unitedcores.com/
51. Utiliti Controls http://www.utiliticontrols.com/
52. valrack modular systems pvt.ltd http://www.valrack.com
53. Wavetronics http://www.wavetronicsindia.com
54. Rane Holdings Limited http://www.rane.co.in

Lighting & luminaries

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

Power Generation

1. Advance Engineering Company - http://www.advanceengineering.com/
2. APGENCO http://www.apgenco.com/
3. Birla Power Solutions Limited http://www.birlapower.com
4. Dyna Hitech Power Systems Ltd http://www.dynahitech.com
5. Essar Group http://www.essar.com/Group/group.asp
6. Essar Power Ltd. http://www.essar.com/
7. Jindal Steel & Power Ltd. http://www.jindalsteelpower.com
8. Kaiga Atomic Power Station http://www.npcil.org/docs/kaigaps.htm
9. Kakrapar Atomic Power Station http://www.npcil.org/docs/kaps.htm
10. Kirloskar Electric Co http://www.kirloskar-electric.com/
11. Lanco Industries http://www.lancogroup.com/groups/kpower/kpower.html
12. Madras Atomic Power Station (MAPS) http://www.npcil.org/
13. Magnum Power Generation Ltd http://www.magnumgrouponline.com/power/
14. Narora Atomic Power Station http://www.npcil.org/docs/naps.htm
15. National Thermal Power Corporation (NTPC) http://www.ntpc.co.in
16. NEPC India Ltd http://www.nepcindia.com
17. PTC India http://www.ptcindia.com
18. Rajasthan Atomic Power Station (RAPS) http://www.npcilraps.com/
19. Rajasthan Renewable Energy Corporation Limited (RRECL) http://www.rrecl.com/
20. Reliance Energy http://www.rel.co.in
21. Tarapur Atomic Power Station http://www.npcil.org/docs/taps.htm
22. Tata Electric Companies http://www.tata.com
23. Tata Power http://www.tatapower.com/
24. Techno Instrument India Pvt.Ltd web site url: http://www.tiiindia.com/

25. Torrent Power web site url: http://www.torrentpower.com/
26. Uttar Pradesh Power Corporation Ltd http://www.uppcl.org/
27. ABB Ltd www.abb.co.in/
28. Adani Power Ltd www.adanipower.com/
29. Aplab Ltd www.aplab.com/
30. BF Utilities Ltd www.bfutilities.com/
31. CESC Ltd. www.cescltd.com/
32. CMI Ltd. www.cmilimited.com.au/
33. DLF Power Limited www.eipowertech.com/dlf_power_limited.htm
34. DPSC Ltd www.dpscl.com/
35. Energy Development Company Ltd www.energy.com.ph/
36. Entegra Ltd www.entegra.co.in/
37. GMR Infrastructure Ltd www.gmrgroup.in/
38. Gujarat Industries Power Company Ltd www.gipcl.com/
39. GVK Power & Infrastructure Ltd www.gvk.com/
40. HBL Power Systems Ltd www.hbl.in/
41. Indowind Energy Ltd www.indowind.com/
42. Indo power projects Ltd www.indopowerprojects.in/
43. Jaiprakash Power Ventures Ltd www.jppowerventures.com/
44. Kalpataru Power Transmission Ltd www.kalpatarupower.com/
45. KSK Energy Ventures Ltd www.ksk.co.in/
46. National Wind & Power Corpn. Ltd www.nationalwind.com/
47. Neyveli Lignite Corpn. Ltd www.nlcindia.com/
48. NHPC Ltd. www.nhpcindia.com/
49. NTPC Limited www.ntpc.co.in/
50. Power Grid Corpn. Of India Ltd www.powergridindia.com/
51. PTC India Ltd www.ptcindia.com/
52. Reliance Power Ltd www.reliancepower.co.in/
53. Savant Infocomm Ltd www.savant-infocomm.com/
54. Sun Source (India) Ltd www.sunsource.in/about_us.htm
55. Suryachakra Power Corpn. Ltd www.suryachakra.in/
56. Suzlon Energy Limited www.suzlon.com/

Electric wires & Cables

1. Aksh Optifibre Limited http://www.akshoptifibre.com/
2. Anant Distributors Private Ltd. http://www.proflexcable.com/
3. Brimson Cables Private Ltd http://www.brimsoncable.com/
4. Capital Cables India Limited - http://www.indiantrade.com/cci/
5. Colt Cables Private Limited http://www.coltcables.com/
6. Cords Cable Industries Ltd http://www.cordscable.com/
7. Delton Cables Limited - http://www.deltoncables.com/
8. Fort Gloster Industries Limited http://www.glostercables.com/
9. Kaydour Cables India http://www.kaydourcables.com
10. KEI Industries Limited http://www.kei-ind.com/
11. Lapp India http://www.lappindia.com/

12. National Cable Industries http://www.nationalcables.com/
13. Navinbhai Cables Private Ltd http://www.ncplindia.com/
14. Neolex Cables http://www.neolexcable.com/
15. North Eastern Cables Private Ltd //www.khetangroup.com/
16. Novoflex Marketing Private Limited. http://www.novoflexgroup.com/
17. Polycab Wires Private Limited http://www.polycab.com/
18. Q-Flex Cables Limited http://www.qflexcable.com/
19. Ravin Cables limited - Primecab brand of cables. http://www.primecab.com/
20. Relemac India http://www.relemacindia.com
21. RollRing Industries - Calicut, Kerala. http://www.rollring.com/
22. Samdaria Electricals http://www.samdariaelectricals.co.in/
23. Satish Enterprises http://www.satishenterprise.com/
24. Shree Nakoda Cables Private Limited. http://www.nakodacables.com/
25. Skytone Electricals (India) http://www.skytonecables.com/
26. Surbhi Cables Industries Private Limited. http://www.indiamart.com/surbhi/
27. Surbhi Telelink Pvt. Ltd http://www.surbhiindia.com/
28. Torrent Cables Ltd http://www.torrentcables.com/
29. Universal Cables http://www.universalcablesltd.com
30. Usha Martin http://www.ushamartin.com
31. Weather Crafts Ltd http://www.weathercraft.com/
32. Finolex Cables Limited http://www.finolex.com

Electrical exporters

1. Arbariya steels http://www.arbariya.com/
2. Bajaj International Pvt. Ltd. http://www.bajajinternational.com/
3. Biax http://www.biaxmetals.com/
4. Brightech Valves and Controls Pvt Ltd http://www.brightechvalves.com
5. Dynamic Scaffolding & Equipment Co http://www.dynamicscaffolding.com/
6. Excel Metal And Engg. Industries http://www.excelmetal.net
7. Impex Trading Company http://www.impextradingco.com
8. Miltop Trading Company http://www.miltop.com/
9. Om(India)Exports http://omindiaexpo.com
10. Oriental Export Corporation http://www.indialinks.com/oriental/
11. Sevana Electrical Group http://www.sevana.com/
12. Veejay Lakshmi Engineering Works Limited http://www.veejaylakshmi.com
13. Vishal Electromag Industries http://www.vishalmotor.com
14. Vaibhav Electricals http://www.vaibhavelectricals.com
15. Industrial Forging Industries http://www.ifi-india.net/
16. Imperial Brass Component http://electronics-electrical.exportersindia.com
17. M/s Horizon Exports http://www.horizonexport.net
18. Golden Crest Marketing Network Pvt. Ltd. http://www.aceenergy.co.in/
19. Shree Krishna Enterprises http://www.shreekrishnaenterprises.co.in/
20. Sahiba International Trading Company http://www.sahibainternational.com
21. Pushpak Metals web site url: http://www.pushpakmetals.com/
22. IEEMA http://www.ieema.org

23. ELSTER METERING (P) LTD http://www.elstermetering.com/
24. Shivam Electronics http://www.shivamelectronics.com
25. SUBRTO http://www.subrtoburnishing.com/
26. Unitek Engineers http://www.unitekengineers.com
27. Euro Technologies http://www.eurotapes.in/

Measurements & Instrumentation

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

Power Distribution

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

Transformers

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

Green Energy Companies in India

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

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

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

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

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

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

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

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

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

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

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

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

Internationally renowned MNC's to offer electrical jobs

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

Top core companies in India to offer electrical jobs

1. Bharat Sanchar Nigam Limited
2. Tata Consultancy Services
3. Bharti Airtel Limited
4. Wipro Ltd
5. Infosys Technologies Limited

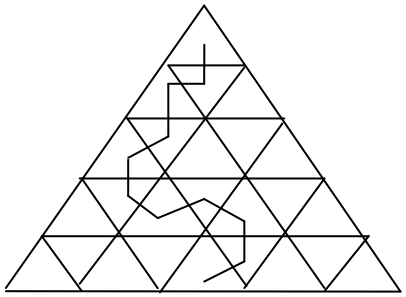
6. Hewlett-Packard India
7. HCL Infosystems Limited
8. Reliance Communications Ltd
9. LG Electronics India Pvt Ltd
10. IBM India Pvt Ltd
11. Videocon Industries Ltd
12. HCL Technologies Limited
13. Satyam Computer Services Ltd
14. Siemens Ltd.
15. Samsung India Electronics Pvt. Ltd.
16. Mahanagar Telephone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

Exclusive Government jobs for Electrical Engineers

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

01 A circle has 29 points arranged in a clockwise manner numbered from 0 to 28, as shown in the figure below. A bug moves clockwise around the circle according to the following rule. If it is at a point i on the circle, it moves clockwise in 1 second by (1 + r) places, where r is the reminder (possibly 0) when i is divided by 11. Thus if it is at position 5, it moves clockwise in one second by (1 + 5) places to point 11. Similarly if it is at position 28 it moves (1 + 6) or 7 places to point 6 in one second.
If it starts at point 23, at what point will it be after 2012 seconds?
(a) 1 (b) 7 (c) 15 **(d) 20**

02 Consider an equilateral triangle of side length n, which is divided into unit triangles, as shown. Let f(n) be the number of paths from the triangle in the top row to the middle triangle in the bottom row, such that adjacent triangles in our path share a common edge and the path never travels up (from lower row to a higher row) or revisits a triangle. An example of one such path is illustrated below for n = 5. Determine the value of f(2005)



(a) f(2005)=(2001)! (c) f(2005) = (2011)!
(b) f(2005)=(2004)! (d) f(2005) = (2020)!

03 Jake can dig a well in 16 days. Paul can dig the same well in 24 days. Jake, Paul and Hari together dig the well in 8 days. Hari alone can dig the well in
(a) 32days **(b) 48 days** (c) 96 days (d) 24 days

04 $P(x) = (x^{2012} + x^{2011} + x^{2010} + \ldots + x + 1)^2 - x^{2012}$
$Q(x) = x^{2011} + x^{2010} + \ldots + x + 1$
The reminder when P (x) is divided by Q (x) is
(a) x + 1 **(b) 0** (c) 1 (d) x – 1

05 An organization has three committees. Only two persons are members of all three committees, but every pair of committees has three members in common. What is the LEAST possible number of the members on any one committee?
(a) 4 (b) 6 (c) 7 (d) 5

06 Jake is faster than Paul. Jake and Paul each walk 24 km. The sum of their speeds is 7 km/h and the sum of time taken by them is 14 hours. Then Jake's speed is equal to :
(a) 7 kmph (b) 3 kmph (c) 5 kmph **(d) 4 kmph**

07 If a lemon and an apple together cost Rs. 12.00, a tomato and a lemon cost Rs. 4.00 and an apple cost Rs.8.00 more than a tomato or a lemon then which of the following can be the price of a lemon?
(a) Rs 2 (b)Rs 4 (c) Rs 1 (d) Rs 3

08 3 mangoes and 4 apples costs Rs 85. 5 apples and 6 peaches costs Rs. 122. 6 mangoes and 2 peaches cost Rs.114. what is the combined price of 1 apple, 1peach and 1 mango?
(a) 37 Rs (b) 39 Rs (c) 35 Rs (d) 36 Rs

09 A child was looking for his father. He went 90 metres in the East before turning to his right. He went 20 metres before turning to his right again to look for his father at his uncle's place 30 metres from this point. His father was not there. From here he went 100 metres to the North before meeting his father in a street. How far did the son meet his father from the starting point?
(a) 90 (b) 30 (c) 80 **(d) 100**

10 If YWUSQ is 25 - 23 - 21 - 19 - 17 then MKIGF is
(a) 13 - 11 - 9 - 7 - 6 (c) 9 - 8 - 7 - 6 - 5
(b) 1 - 2 - 3 - 5 - 7 (d) 7 - 8 - 4 - 5 - 3

11 The addition 641 + 852 + 973 = 2456 is incorrect. What is the largest digit that can be changed to make the addition correct?
(a) 5 (b) 6 (c) 4 **(d) 7**

12 Raj drives slowly along the perimeter of a rectangular park at 24 kmph and completes one full round in 4 minutes. If the ratio of the length to the breadth of the park is 3:2, what are its dimensions?
(a)450m x 300m (b)150m x 100m **(c)480m x 320m** (d) 100m x 100m

13 Ahmed, Babu, Chitra, David and Eesha each choose a large different number. Ahmed says, " My number is not the largest and not the smallest". Babu says, "My number is not the largest and not the smallest". Chitra says, "My number is the largest". David says, " My number is the smallest". Eesha says, " My number is not the smallest".
Exactly one of the five children is lying. The others are telling the truth. Who has the largest number?
(a) Eesha (b) David (c) Chitra (d) Babu

14 In the equation A + B + C + D + E = FG where FG is the two digit number whose value is 10F + G and letters A, B , C , D , E, F and G each represent different digits. If FG is as large as possible. What is the value of G?
(a) 4 **(b) 2** (c) 1 (d) 3

15 In a G6 summits beings held at London, a French, a German, An Italian, a British, a Spanish and a Polish diplomat represent their respective countries and participate in a round table conference to strengthen co-operation between these countries. There are exactly six chairs evenly spaced around a circular table. The chairs are numbered 1 through 6, with successively numbers chairs next to each other and chair number 1 next to chair 6. Each chair is occupied by one of the diplomats. The following condition apply :
-Polish sits immediately next to the British
-German sits immediately next to Italian, British, or both
-French does not sit immediately next to Italian
-If Spanish sits immediately next to Polish, Spanish does not sit immediately next to

Italian.

Which one of the following sitting arrangements of the six diplomats in chairs 1 through 6 would NOT violate the stated conditions?

(A) French, Polish, British, Italian, Spanish, German
(B) French, German, Italian, Polish, British, Spanish
(C) French, German, Italian, Spanish, Polish, British
(D) French, Spanish, Polish, British, German, Italian
(E) French, British, German, Spanish, Italian, Polish

(a) C (b) D (c) A **(d) B**

16 In this question, A^B means A raised to power B. If x*y^2*z < 0, then which one of the following statements must also be true?

I. xz < 0
II. z < 0
III. xyz < 0

(a) I and II (b) III only (c) None of the above **(d) I only**

17 At 12.00 hours Jake starts to walk from his house at 6 kms an hour. At 13.30 hours, Paul follows him from Jake's house on his bicycle at 8 kms per hour. When will Jake be 3 kms behind Paul?

(a) 19:00 hrs (b) 18:30 hrs (c) 20:00 hrs **(d) 19:30 hrs**

18 There is a set of 9 numbers that relate to each other in a certain way. Find the way the first set of boxes works. The numbers in the second set work in exactly the same way. Find the number that must go in the empty box in the second set.

20	6	22	12	15	3
5	8	12	6		12
75	42	102	54	81	45

(a) 16 (b) 9 **(c) 12** (d) -21

19 A farmer has a rose garden. Every day he either plucks 7 or 6 or 24 or 23 roses. The rose plants are intelligent and when the farmer plucks these numbers of roses, the next day 37 or 36 or 9 or 18 new roses bloom in the garden respectively. On Monday, he counts 189 roses in the garden. He plucks the roses as per his plan on consecutive days and the new roses bloom as per intelligence of the plants mentioned above. After some days which of the following can be the number of roses in the garden?

(a) 4 (b) 7 (c) 30 (d) 37

20 What is the value of $(44444445*88888885*44444442+44444438)/44444444^2$

(a) 88888883 (b) 88888884 (b) 88888888 (b) 44444443

21 A cow and a horse are bought for Rs.200000. The cow is sold at a profit of 20% and the horse is sold at a loss of 10%. The overall gain is Rs.4000. The cost price of the cow is:

(a) Rs.1,30,000 **(b) Rs.80,000** (c) Rs.70,000 (d) Rs.1,20,000

22 When numbers are written in base b, we have 12 * 25 = 333. The value of b is

(a)8 (b) 6 (c) None of these **(d) 7**

23 If X^Y denotes X raised to the power Y, Find the last two digits of (1941 ^ 3843) + (1961 ^ 4181).

(a)12 (b) 22 (c) 42 **(d)82**

24 George can do some work in 8 hours, Paul can do the same work in 10 hours while Hari can do the same work in 12 hours. All the three of them start working at 9 a.m while George stops work at 11 a.m and remaining two complete the work. Approximately at what time will the work be finished?

(a) 12 noon (b) 11.30 am (c) 12.30 pm **(d) 1 pm**

25 At the end of 1994 Rohit was half as old as his grandmother. The sum of the years in which they were born is 3844. How old Rohit was at the end of 1999?

(a) 48 (b) 55 (c)49 **(d) 53**

26 If M is 30% of Q, Q is 20% of P and N is 50% of P then M/N =

(a) 4/3 **(b) 3/25** (c) 6/5 (d) 3/250

27 There are 5 sweets – Jumun, Kulfi, Peda, Laddu and Jilabi that I wish to eat on 5 consecutive days – Monday through Friday, one sweet a day, based on the following self imposed constraints:

1) Laddu is not eaten on Monday
2) If Jamun is eaten on Monday, then Laddu must be eaten on Friday
3) If Laddu is eaten on Tuesday, Kulfi should be eaten on Monday
4) Peda is eaten the day following the day of eating Jilabi

Based on the above, peda can be eaten on any day except?

(a) Tuesday **(b) Monday** (c) Wednesday (d) Friday

28 In a office, at various times during the day the boss gives the secretary a letter to type, each time putting the letter on the top of the pile in the secretary's inbox. When there is time, the secretary takes the top letter off the pile and type's it. If there are five letter in all , and the boss delivers in the order of 1 2 3 4 5, which of the following could NOT be the order in which secretary types them.

(a) 2 4 3 5 1 **(b) 4 5 2 3 1** (c) 3 2 4 1 5 (d) 1 2 3 4 5

29 For which of the following "n" is the number $2^{74} + 2^{2058} + 2^{2n}$ a perfect square?

(a) 2012 (b) 2100 (c) 2011 **(d) 2020**

30 Raj writes a number. He sees that the number of two digits exceeds four times the sum of its digit by 3. If the number is increased by 18, the result is the same as the number formed by reversing the digit. Find the number

(a) 35 (b) 57 (c) 42 (d) 49

TCS1 – Detailed Solution

01 Ans (d)

A bug moves clockwise starting from point 23.

Points (N)	Remainder(r) (N/11)	Points to be moved (1 + r)	New point position	Time (sec)
23	1	2	25	1
25	3	4	0	2
0	0	1	1	3
1	1	2	3	4
3	3	4	7	5
7	7	8	15	6
15	4	5	20	7
20	9	10	1	8
1	1	2	3	9
3	3	4	7	10

We can see a pattern emerging in the point positions from the 3rd second onwards…1, 3, 7, 15, 20 and then the cycle keeps repeating. After 5 s, 10 s, 15 s, the bug's position is 7. So after 2010s, the position should be 7. The position after 2011s is 15, and after 2012s it is 20.

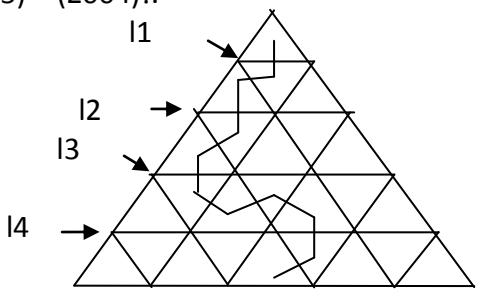
02 Ans (b)

We shall show that f(n) = (n − 1)!.

Label the horizontal line segments in the triangle l1, l2 , . . . as in the diagram below.

Since the path goes from the top triangle to a triangle in the bottom row and never travels up, the path must cross each of l1, l2, . . , ln−1 exactly once. The diagonal lines in the triangle divide lk into k unit line segments and the path must cross exactly one of these k segments for each k. (In the diagram below, these line segments have been highlighted.) The path is completely determined by the set of n − 1 line segments which are crossed. So as the path moves from the kth row to the (k + 1)st row, there are k possible line segments where the path could cross lk. Since there are $1 \cdot 2 \cdot 3 \cdot \cdot \cdot (n-1) = (n-1)!$ ways that the path could cross the n − 1 horizontal lines, and each one corresponds to a unique path, we get f(n) = (n − 1)!.

Therefore f(2005) = (2004)!.



03 Ans (b)

Total number of work to be done= 48 Units (LCM of 16,24,8)

Jake's one day work = 48/16 = 3 Units

Paul's one day work = 48/24 = 2 Units

Jake, Paul and Hari one day work = 48/8 = 6 Units

We know that Jack does 3 units and Paul does 2.

3+2+Hari = 6 Units

Hari = 1 Unit/day = 48/1 = 48 days

Hari does 1 unit per day and can dig a well in 48 days.

04 Ans (b)

Substituting 1 for x, the numerator is $2013^2 - 1^2$

This can be written in the form (2013 + 1) (2013 -1) = (2014)(2012)

The denominator is 2012 and since the numerator is a multiple of 2012, the remainder is exactly 0.

05 Ans (a)

Let there be a total of 5 people (a, b, c, d and e).

I committee	II committee	III committee
a	A	a
b	B	b
c	C	d
d	E	e

These satisfy the conditions given in the question and there should at least be 4 members in the committee.

06 Ans (d)

Given that speed of Jake is greater than Paul.

Distance = 24 km

Sum of their speed is 7 km/h = J+P

So possible speed ratio between J & P is

Go by Option

6:1 Not in option

5:2 = (24/5)+(24/2) ≠ 14 Hours

4:3 = (24/4)+(24/3) = 14 Hours

So Jake's speed is 4km/h.

07 Ans (a)

Let cost of a Lemon is L

Let cost of a Apple is A

Let cost of a Tomato is T

L+A = 12 – (1)

T+L = 4 - (2)

A = 8+L - (3)

A = 8+T - (4)

Sub (3) in (1)

L+8+L = 12

L = 2, A = 10, T = 2.

08 Ans (a)

3M + 4A = 85 - (1)

5A + 6P = 122 – (2)

6M + 2P= 114 – (3)

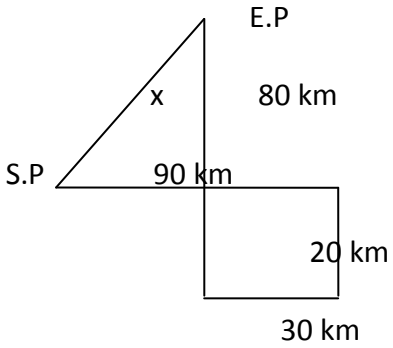
From 2 and 3,

5A + 6P = 122

18M + 6P = 342

From the above we get, 18M – 5A = 220 – 4
Solving 1 and 4, we get A = 10 and M = 15. We get P = 12.
Cost of 1 apple, 1 peach and 1 mango is equal to 37 (10+15+12).

09 Ans (d)



$x=\sqrt{(60^2+80^2)}$
x=100

10 Ans (a)
Each letter represents their position in the alphabetical order.

11 Ans (d)

6	4	1
8	5	2
9	**7**	3
24	**6**	6

So the largest digit that cane be changed is 7 in order to bring the solution as 2456.

12 Ans (c)
S = 24km/h = 24*(5/18) = 20/3 m/sec
T = 4 min = 240 sec
Perimeter = 2(l+b) = (20/3)*240
2(l+b) = 1600 m
l+b = 800 m
l:b = 3:2
l = (3/5)*800 = 480 m
b = (2/5)*800 = 320 m

13 Ans (a)
Ahmed and Babu cannot lie because each of them say two facts (not the largest, not the smallest) and there is no chance for both the facts to be wrong. David says “My number is smallest”. If David lies, one of the remaining four should lie. But exactly one person lies in this problem. So David says the truth. If David’s statement is true, Eesha’s statement is also true. The one who lies is Chitra and Eesha has the largest number.

14 Ans (b)
FG is as large as possible and all the 7 numbers should be different.
Let’s try out a few possibilities..
9 + 8 + 7 + 6 + 5 = 35…5 is getting repeated twice.
9 + 8 + 7 + 6 + 4 = 34…4 is getting repeated
9 + 8 + 7 + 5 + 4 = 33…3 repeats

9 + 8 + 6 + 5 + 4 = 32
None of the numbers repeat in the above case and 32 is the maximum number FG can have. The value of G is 2.

15 Ans (d)
Going through the options, one can rule out A, C, D and E as they violate the given conditions. Only B obeys.

16 Ans (d)
y^2 is a positive number, so definitely x or z should be negative for the product to be a negative value. This means that xz always results in a negative value.

17 Ans (d)
Jake starts at 12.00 and covers 6 km/h
Paul starts at 1.30 and covers 8 km/h
Relative speed between Jake & paul is 2 kmph, where Paul stating Jake is 9 km ahead of Paul. From 13.30 hours paul takes 4.30 hrs to meet Jake. Again he needs 1.30 hrs to lead Jake by 3 km Relative speed. Totally he takes 6 hrs. so 13.30+6 = 19.30 hrs.

18 In any particular column, the third number is the sum of the first and second multiplied by 3. 81 is 15 plus 12 multiplied by 3.

19 Ans (a)
We can ignore 7 and 6 and we can check with 24 and 23 as the number of roses has decreased. If he plucks 24, the next day 9 new roses bloom. The numbers go on decreasing by 15. If you keep decreasing 15 starting from 189, we find that none of the options match. Let's check this for 23. When he plucks 23, 18 new roses bloom every day and it goes decreasing by 5 each day. If you keep decreasing 5 from 189, you'll get 4 at a point.

20 Ans (a)
Let 44444444 = x

$$\frac{(x+1)*(2x-3)*(x-2)+(x-6)}{x^2}$$

$$\frac{(x^2-x-2)(2x-3)+(x-6)}{x^2}$$

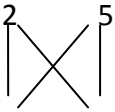
$$\frac{2x^3-2x^2-4x-3x^2+3x+6+x-6}{x^2}$$

$$\frac{2x^3-5x^2}{x^2} = 2x-5$$

= 2(44444444)-5 = 88888883

21 Ans (a)
Let the cost price of cow and horse is C and H Respectively
C + H = 200000 - (1)
1.2C + .8H = 204000 - (2)
Solving euation (1) & (2)
C = 80000.

22 2 5



1 2
3 3 3
5 times 2 is 10, but we have 3 in the solution. This means that there is a change in base. In base 7, 13 corresponds to 10 in base 10 system. One can see it works for the remaining numbers too. So the base is 7.

23 Ans (d)
1941^2 ends in 81. 1941^3 ends in 21, 1941^4 ends in 61, 1941^5 ends in 01 and 1941^6 ends in 41 and this cycle keeps repeating. Similarly the cycle for 1961 powers is 61, 21, 81, 41, 01 and the cycle repeats. After adding up the final two digits of these numbers for their respective powers, we find that the sum is 82.

24 Ans (d)
Total number of work to be done= 120 Units (LCM of 8,10,12)
George's one hour work = 120/8 = 14 Units
Paul's one hour work = 120/10 = 12 Units
Hari's one hour work = 120/12 = 10 Units
Units of work finished at 11 AM = (14+12+10)*2 = 74
Remaining work to be done = 120-74 = 46 units
One hour Paul + Hari work = 22 units
Approximately they will take two hours to finish the work
So the work will get finished at 1 PM

25 Ans (d)
End of 1994 Rohit = Grandmother/2
$R_B+G_B = 3844$
1999 Rohit age = ?
[1994-(G/2)]+[1994-G] = 3884
-3G/2 = -144
G = 48
Then Rohit age in 1994 = 48 years
Five years later in 1999, Rohit's age was 53 years.

26 Ans (b)
M is 30% of Q
Q is 20% of P
Nis 50 % of P
Then M/N = ?
Let P= 100
N = 50
Q = 20
M = 6
M/N = 6/ 50 =3/25.

27 Ans (b)

Peda can be had only after having Jilabi. So Peda can never be had on the starting day, which is Monday.

28 Ans (b)
Going by the options and checking logically which order is possible, we can see that all given orders are possible except the order in option (b).

29 Ans (d)
$2^{2*37} + 2^{2058} + 2^{2n}$
$a^2 + 2ab + b^2$
$(2^{37})^2 + (2^n)^2 + 2*2^{37}*2^n$
Here $a = 2^{37}$, $b = 2^n$,$2ab = 2^1*2^{37}*2^n$
$2^{38+n} = 2^{2058}$
$38+n = 2058$
$n = 2020$

30 Ans (a)
Going by the options, 35 = 8(4) + 3. So option (a).

01 Hanuman can complete a bridge in 10 days and Ravanan can complete the same bridge in 20 days. Now they are working together and they are completing the bridge in 20 days. What is the contribution of Ravanan in constructing the bridge?

(a) Half the work (c) Two-fourth of the bridge

(b) One-third of the work **(d) Destructing the bridge**

02 (a% of a) + (b% of b) = 2% of ab, then what percentage of a is b?

(a) 50% (b) 75% **(c) 100%** (d) Cannot be determined.

03 When numbers are written in base b, we have 15*22 = 414, the value of b is

(a) 8 (b) 7 **(c) 6** (d) None of these

04 5 coffee and 4 tea costs Rs.96, 5 badam milk and 6 coffee costs Rs. 32 and 7 tea and 6 badam milk costs Rs.37. What is the combined price of 1tea, 1 coffee and 1 badam milk?

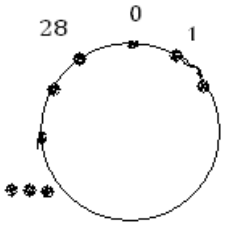
(a) 12 **(b) 15** (c) 20 (d) 16

05 There is a set of numbers that relate to each other in a certain way. Find the way the first set of boxes works. The numbers in the second set work in exactly the same way. Find the number that must go in the empty box in the first set.

30	11	128	67		219
6	3	6	3	6	3
144	19	634	131	1724	435

(a) 343 **(b) 346** (c) 349 (d) 643

06 A circle has 29 points arranged in a clockwise manner numbered from 0 to 28, as shown in the figure below. A bug moves clockwise around the circle according to the following rule. If it is at a point i on the circle, it moves clockwise in 1 second by (1 + r) places, where r is the reminder (possibly 0) when i is divided by 11. Thus if it is at position 5, it moves clockwise in one second by (1 + 5) places to point 11. Similarly if it is at position 28 it moves (1 + 6) or 7 places to point 6 in one second.
If it starts at point 28, at what point will it be after 9994 seconds?



(a) 1 (b) 5 (c) 7 **(d) 3**

07 Jake is faster than Paul. Jake and Paul each walk 40 km. The sum of their speeds is 13 km/h and the sum of time taken by them is 13 hours. Then Jake's speed is equal to :

(a) 7Kmph **(b) 8Kmph** (c) 13Kmph (d) 9Kmph

08 $P(x) = (x^{999} + x^{998} + x^{997} + \ldots + x + 1)^2 - x^{999}$

$Q(x) = x^{998} + x^{997} + \ldots + x + 1$

The reminder when P (x) is divided by Q (x) is

(a) x + 1 **(b) 0** (c) 1 (d) x – 1

09 A Samsung duo and a Galaxy are bought for Rs.40000. The Duo is sold at a profit of 33.33% and the Galaxy is sold at a loss of 20%. There was no loss or gain. Find the cost price of the Samsung duo ?

(a) Rs.15,000 (b) Rs.25,000 (c) Rs.20,000 (d) Rs.18,000

10 If a Strawberry and a Butterscotch together cost Rs. 18.00, a Vanilla and a Strawberry cost Rs. 9.00 and a Butterscotch cost Rs.9.00 more than a Vanilla or a Strawberry then which of the following can be the price of a Butterscotch?

(a) Rs. 13.5 (b) Rs.10 (c) Rs. 12 (d) Rs. 13

11 If KMNOQ is 7- 5 - 4 - 3 - 1 and DEFIJ is 4-5-6-9-8 and RSWYZ is 2-3-7-9-8 then AGVXH is

(a) 1 - 7 - 6- 8 - 8 (b) 1 - 7 - 3 - 5 - 7 (c) 9 - 3 - 7 - 6 - 5 (d) 7 - 8 - 4 - 5 - 3

12 My next door neighbour lies a lot. In fact, he only tells the truth on one day a week! One day he told me, "I lie on Mondays and on Tuesdays."The next day he said, "Today is either Thursday, Saturday or Sunday."The next day he said, "I lie on Wednesdays and Fridays."
On which day of the week does my neighbour tell the truth?

(a) Monday (b) Tuesday **(c) Wednesday** (d) None of these

13 The addition 457 + 982 + 896 = 2345 is incorrect. What is the least digit that can be changed to make the addition correct?

(a) 5 (b) 7 (c) 6 (d) 3

14 A child was looking for his father. He went 42 metres in the East before turning to his right. He went 20 metres before turning to his right again to look for his father at his uncle's place 30 metres from this point. His father was not there. From here he went 25 metres to the North before meeting his father in a street. How far did the son meet his father from the starting point?

(a) 7 (b) 25 **(c) 13** (d) 11

15 At the end of 1994 Rohit was $1/4^{th}$ as old as his grandmother. The sum of the years in which they were born is 3843. How old Rohit was at the end of 2001?

(a) 48 **(b) 36** (c) 29 (a) 34

16 Raj writes a number. He sees that the number of two digits is 9 less than 3 times the number. If the number is increased by 45, the result is the same as the number formed by reversing the digit. Find the number.

(a) 35 **(b) 27** (c) 36 (d) 49

17 Find the value of "n" where $3^{48} + 3^{1996} + 3^{3943} + 3^{3n}$.

(a) 1963 (b) 1964 (c) 1960 (d) 1991

18 There are 5 sweets – Milk peda, Ice cream, Rasagulla Paper sweet and Rasamalai that I wish to eat on 5 consecutive days – Monday through Friday, one sweet a day, based on the following self imposed constraints:

1) Paper sweet is not eaten on Monday
2) If Milk peda is eaten on Monday, then Paper sweet must be eaten on Friday
3) If Paper sweet is eaten on Tuesday, Ice cream should be eaten on Monday
4) Rasagulla should be eaten on the day preceding to the day of eating Milk peda.

Based on the above, Rasagulla can be eaten on any day except?

(a) Tuesday (b) Monday (c) Wednesday **(d) Friday**

19 Raj drives slowly along the perimeter of a rectangular park at 24 kmph and completes one full round in 4 minutes 30 seconds. If the ratio of the length to the breadth of the park is 5 : 7, what are its dimensions?

(a)1500m x 700m **(b) 375m x 525m** (c) 35m x 49m (d) 100m x 100m

20 In a office, at various times during the day the boss gives the secretary a letter to type, each time putting the letter on the top of the pile in the secretary's inbox. When there is time, the secretary takes the top letter off the pile and type's it. If there are five letter in all , and the boss delivers in the order of 5 4 3 2 1, which of the following could be the order in which secretary types them.

(a) 2 4 3 5 1 **(b) 4 5 2 3 1** (c) 1 2 3 5 4 (d) 3 1 2 5 4

21 Daniel can do some work in 12 hours, Roy can do the same work in 10 hours while Hillari can do the same work in 15 hours. All the three of them start working at 9 a.m while Daniel stops works at 11 a.m and remaining two complete the work. Approximately at what time will the work be finished?

(a) 1.30 pm (b) 12.30 am **(c) 2.00 pm** (d) 1.00 pm

22 In the equation A + B + C + D + E = FG where FG is the two digit number whose value is 10F + G and letters A, B , C , D , E, F and G each represent different digits. If FG is as small as possible. What is the value of G?

(a) 4 (b) 2 **(c) 0** (d) 3

23 In this question, A^B means A raised to power B. If x^2*y*z < 0, then which one of the following statements must also be true?

I. yz < 0
II. z < 0
III. x < 0

(a) I only (b) III only (c) I & II only (d) None of the above

24 At 12.00 hours Ravi starts to walk from his house at 8 kms an hour. At 13.30 hours, Shankar follows him from Ravi's house on his bicycle at 12 kms per hour. When will Ravi be 6 kms behind Paul?

(a) 18:00hrs (b)18:30hrs (c) 20:00hrs (d) 19:30hrs

25 What is the value of (222224*444445*222221+666668)/222222^2

(a) 444444 **(b) 444447** (c) 222224 (d) 444222

26 Seven varsity basket ball players (A, B, C, D, E, F and G) are to be honoured at a special luncheon. The players will be seated on the dias in a row. A and G have to leave the luncheon early and so must be seated at the extreme right .B will receive the most valuable player's trophy and so must be in the centre to facilitate presentation .C and D are bitter rivals and, therefore must be seated as far apart as possible.

Which of the following pair cannot occupy the seats on either side of B?

(a) F and D (b) D and E **(c) E and G** (d) C and F

27 An organization has 4 committees. Only 3 persons are members of all four committees, but every pair of committees has 4 members in common. What is the LEAST possible number of the members on any one committee?

(a) 4 **(b) 6** (c) 7 (d) 5

28 Aravind can do a work in 24 days. Mani can dig the same well in 36 days. Aravind, Mani and Hari can do a work together in 8 days. Hari alone can do the work in

(a) 12days **(b) 18 days** (c) 16 days (d) 24 days

29 A farmer has a rose garden. Every day he either plucks 7 or 6 or 24 or 23 roses. The rose plants are intelligent and when the farmer plucks these numbers of roses, the next day 37 or 36 or 9 or 18 new roses bloom in the garden respectively. On Monday, he counts 189 roses in the garden. He plucks the roses as per his plan on consecutive days and the new roses bloom as per intelligence of the plants mentioned above. After some days which of the following can be the number of roses in the garden?

(a) 26 **(b) 249** (c) 232 (d) 27

30 What is the unit's digit of 21^3 *21^2*34^7*46^8*77^8 ?

(a) 4 (b) 8 (c) 6 (d) 2

01 Ans(d)

If they are both doing a positive work then they would have completed the work in less than 10 days, but still they are consuming 20 days together. This is possible only when one of them is doing a negative work. If Hanuman is doing the negative work then the bridge won't get completed. So the only other person to do the negative work should be Ravanan. Thus Ravanan's contribution in constructing the bridge is Destructing it.

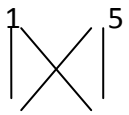
02 Ans(c)

$(a/100)* a +(b/100) * b = (2/100) ab$

$a^2+b^2 =2ab$ and $(a-b)^2 = 0$

a=b

03 Ans(c)



2 2

4 1 4

5 times 2 is 10, but we have 4 in the solution. This means that there is a change in base. In base 6, 14 corresponds to 10 in base 10 system. One can see it works for the remaining numbers too. So the base is 6.

04 Ans(b)

5C+4T=96; 5B+6C=32; 7T+6B=37;

Therefore 5C+4T+5B+6C+7T+6B =96+32+37

i.e., 11C+11T+11B=165

then 1C+1T+1B=15.Rs

05 Ans(b)

First Row follows the pattern x^3+3…

Second row follows y^2+2

Third row follows the (product of first set and second set) – (Sum of first set and second set)

06 Ans (d)

A bug moves clockwise starting from point 23.

Points (N)	Remainder(r) (N/11)	Points to be moved (1 + r)	New point position	Time (sec)
23	1	2	25	1
25	3	4	0	2
0	0	1	1	3
1	1	2	3	4
3	3	4	7	5
7	7	8	15	6
15	4	5	20	7
20	9	10	1	8
1	1	2	3	9

We can see a pattern emerging in the point positions from the 3rd second onwards…1, 3, 7, 15, 20 and then the cycle keeps repeating. After 5 s, 10 s, 15 s, the bug's position is 7. So after 2010s, the position should be 7. The position after 2011 s is 15, and after 2012 s it is 20.

07 Ans (b)

Given that speed of Jake is greater than Paul.

Distance = 40 km

Sum of their speed is 13 km/h = J+P

So possible speed ratio between J & P is

Go by Option
12:1, 11:2, 10:3, Not in option
8:5= (40/8)+(40/5) = 13 Hours
So Jake's speed is 8km/h.

08 Ans(b)
Substituting 1 for x, the numerator is $1000^2 - 1^2$
This can be written in the form (1000 + 1) (1000 -1) = (1001)(999)
The denominator is 999 and since the numerator is a multiple of 999,the remainder is exactly 0

09 Ans (a)
x+y= 40000
1.33x+ 0.8y= 40000
By solving these two equations:
The price of Samsung Duo, ie, x=15094 ~15000

10 Ans (a)
Butterscotch costs 9 more than a strawberry or Vanilla means Strwberry= Vanilla.
Since Vanilla +Strawberry=9
Vanilla= 4.5 and Strawberry = 4.5
Then we know that Butterscotch + Strawberry= 18
So Butterscotch= 18-4.5=13.5.

11 Ans(a)
A-1 B-2 C-3 D-4 E-5 F-6 G-7 H-8 I-9 J-8 K-7 L-6 M-5 N-4 O-3 P-2 Q-1 R-2 S-3 T-4 U-5 V-6 W-7 X-8 Y-9 Z-1
then AGVXH is 17688

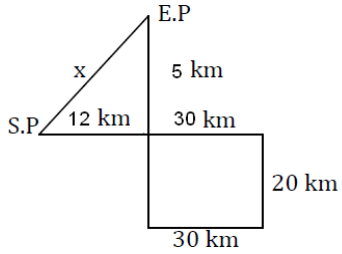
12 Ans(c)
The first statement is made on Thurs, he lies.
Second on Friday, Again he lies saying its Thurs, Sat or Sun.
On sat again he has to lie , he says wed and Fri he lies, on fri he lies is true , So the false statement is that he lies on Wednesdays.

13 Ans (a)

4	**5**	7
9	8	2
8	9	6
23	**4**	5

So the smallest digit that cane be changed is 5 in order to bring the solution as 2345.

14 Ans(c)



Therefore $X=\sqrt{(12^2+5^2)}$
$X= \sqrt{169}$
X=13 Km

15 Ans (b)
End of 1994 Rohit = Grandmother/4
R_B+G_B = 3843
1999 Rohit age = ?

[1994-(G/4)]+[1994-G] = 3843
5G/4 = 145
G = 29*4
Then Rohit age in 1994 = 29 years
Seven years later in 2001, Rohit's age was 36 years.

16 Ans(b)
Going by the options, 27 = 3(27) – 9
27+45=72(number reversed).

17 Ans(a)
It is in the format as
$a^3+3a^2b+3ab^2+b^3$
i.e., $(3^{16})^3+ 3.3^{32}.3^n+ 3.3^{16}.3^{2n}+3^{3n}=3^{48} + 3^{1996} + 3^{3943}+3^{3n}$
From this we can say that $3^{33+n}=3^{1996}$
33+n=1996
n=1963.

18 Ans(d)
Rasagulla should be eaten on the day preceding to the day on which uh eat milk peda. Friday is the last day and hence cannot be preceded by any other day.

19 Ans(b)
He travels at 24km/hr for 4min 30 sec.
Converting into m/s his speed is 20/3m/s.
He travels so for 4*60+30sec=270sec.
So he travels (20/3)*270 m = 1800m = 2(l+b) = l+b = 900
We know that the length and breadth are in the ratio 5:7
So 5x+ 7x= 900
X=75
Hence 5x=375 and 7x= 525.

20 Ans(b)
Only the Second option is feasible as
5 → 1st
4 → 2nd
3 → 4th
2 → 3rd
1 →
Here the only one in the stack left out is 1, which is taken out in the last place.

21 Ans(c)
Let the total work be 60 .
That means Daniel will do 5 parts , Hillary 4 parts and oy 6 parts.
Total work they do together in an hour is 15 parts. So from 9am to 11am in two hours they complete 30 parts.
Next Daniel leaves Hillary+Roy do 4+6=10 parts/hour.
Hence next 30 parts will be completed in 3 hours.
Hence the work will be over by 2pm.

22 Ans(c)
The minimum values substituted here are 4+5+6+7=8=30 ,
Hence G=0.

23 Ans(a)
We know that x^2*y*z<0
X^2 will always be positive, hence it is obvious that y*z has to be negative to make the

equation correct.
Thus y*z<0 is correct.

24 Ans(a)
The distances travelled by Shankar and Ravi.

Time	Ravi	Shankar
1.00	8	0
2.00	16	6
3.00	24	18
4.00	32	30
5.00	40	42
6.00	48	54

So at 6pm the distance between them is 6km.

25 Ans(b)
The tens and units place of the dividend are 2 and 8
The units place of divisor is 4.
28/4=7
The number should end with 7.

26 Ans (c)
The pair E and G cant occupy it as G will have to be at the end since he is leaving early.

27 Ans (b)
The least number will be 6.
If it is 5 then The arrangements would be
ABCDE
ABCDF
ABCEF,but in the last arrangement it cant be possible to have 4 people common as it has to be ABC D/E/F asnd some other person X.
So with 6 the arrangement would do better.

28 Ans (b)
Let the total work be 72 parts.
So A does 3 parts.
M does 2parts and (A+M+H) do 9 parts Hence H alone does 4 parts.
If he did the work alone he could have completed it in 72/4=18 days.

29 Ans(b)
IF he plucks 7, increase is of 30 flowers.
If he plucks 6. Increase is of 30 flowers.
If again he plucks 24, decrease of 15 flowers.
And in case of 23, decrease of 5 flowers.
And option B definitely satisfies the criteria.

30 Ans(a)
For 21^5 unit digit will be 1
For 34^7 it will be 4,
For 46^8, it will be 6
And for 77^8, it will be 1
So the total unit digit will be what 1*4*6*1 has, ie 4.

MOCK EMAIL WRITING QUESTIONS

Directions:

1. Use all the phrases given
2. Minimum words should be 50 otherwise your email cannot be validated
3. Addressing and signing should be done as in the question given.
4. Common grammatical rules, punctuation should be according to standard English.
5. You can use your own phrases along with the phrases given.

Question : 1

As a member of your residential society, write an email to inspector of local Police station, Mr.Sharma, informing him about miscreants who ride their bikes rashly every evening outside your society. Sign the email as william.

residential area - ride - rashly - children - play - elderly - walk - grocery shop - across the road - dangerous - accidents - nuisance - action - immediately.

Sample Answer:

Dear Mr.Sharma,

We are the residents of Siddartha Nagar. We would like to bring to your notice that a few guys are riding their bikes very rashly in the evening hours in the main road of the colony. As you know that this is the time when children play on the road and elderly go for an evening walk. Also there is a grocery shop across the road and many housewifes used to cross the road to buy any groceries. In the recent times we observed that due this rash driving many accidents were happened and several injured. This is creating a constant nuisance for all. So we would like to request you to take necessary action to curb these activities.

Thanking you

Yours sincerely,

William.

Question 2:

As a recent buyer of their car, write an email to the Manager of Smart Automative company, Mr.Ahmed, regarding the poor quality of service facility available in the city. Sign the email as Chopra.

Outline:

very few - service centers - complaints - pending problems - maintenance - cost - time - delivery - increase - customer satisfaction

Dear Mr. Ahmed

I recently bought Fiat palio from "Sridhar Fiat show room" in Nagole. Recently I faced small problem with car AC and bought the car for maintenance. But to my utter surprise, the howroom staff told me that service is not available in their showroom and they asked me to take the car to near by service center. I found that there are very few service centers available compared to sales showrooms, and there are many complaints regarding this. This in turn is causing many pending problems and increased maintenance cost, time and delivery time. I would like to suggest you that if more service centers are opened in the city, customer satisfaction also goes up which finally converts into more sales.

Thanks and Regards
Chopra

Question 3:

As a former student, write an email to your professor, Mr.Matt, thanking her for teaching and guidance that contributed to your overall development. Sign the email as peter.

Outline:

Successful - Placed - grateful - help - advice - grooming - values - shaping my future - sincere - professional

Dear Mr.Matt

I am very happy to tell you that I got successful in the recently conducted campus placement drive at my college. I am placed with TCS. I am extremely grateful for your help regarding my preparation. More over your advice regarding personality development helped for my personal grooming. In addition to that, your style of teaching inculcates not only those skills related to

professional success but also for developing values which I believe helps for shaping my career. Once again I would like to thanks for your sincere and professional help.

with warm regards

Peter.

Question 4:

As an intern at ABC consulting Pvt.Ltd, write an email to your internship Project Manager, Mr.Ramesh, informing about the progress that you are making and some difficulties that your are encountering. Sign the email as Ben.

Outline:

Thank - challenging - progress - tight schedule - support - report - analytics - guidance - access - doubt - requirements - design.

Dear Mr.Ramesh

Thank you for allotting a challenging project for my internship. I am making steady progress and learning many new things. The project is due next month and we are on tight schedule. I need some additional support with regard to the reporting of Analytics. Your guidance helped me access the database with ease but I have several doubts regard to the requirements of the design. But I am facing little problem in reporting.

Thanks and regards

Ben

GATE 2016 Examination

Electrical Engineering

Test Date: 6/02/2016

Test Time: 2:00 PM to 5:00 PM

Subject Name: ELECTRICAL ENGINEERING

Section: General Aptitude

Q NO. 1

The man who is now Municipal Commissioner worked as _____.

(A) the security guard at a university

(B) a security guard at the university

(C) a security guard at university

(D) the security guard at the university

[Ans. B]
The man who is now municipal commissioner worked as a security guard at the university

Q NO. 2

Nobody knows how the Indian cricket team is going to cope with the difficult and seamer-friendly wickets in Australia.

Choose the option which is closest in meaning to the underlined phrase in the above sentence.

(A) put up with (B) put in with (C) put down to (D) put up against

[Ans. A]
Nobody knows how the Indian cricket team is going to put the difficult and seamer friendly wickets in Australia

Q NO. 3

Find the odd one in the following group of words.

mock, deride, praise, jeer

(A) mock (B) deride (C) praise (D) jeer

[Ans. C]
Mock, Deride, Jeer all are synonym

Q NO. 4

Pick the odd one from the following options.

(A) CADBE (B) JHKIL (C) XVYWZ (D) ONPMQ

[Ans. D]
In option A, B, C 2nd letter and 1st letter is 2. In option D it is 1.

Q NO. 5

In a quadratic function, the value of the product of the roots (α, β) is 4. Find the value of

$$\frac{\alpha^n + \beta^n}{\alpha^{-n} + \beta^{-n}}$$

(A) n^4 (B) 4^n (C) 2^{2n-1} (D) 4^{n-1}

[Ans. B]

Let $n = 1$, then $\frac{\alpha^n + \beta^n}{\alpha^{-n} + \beta^{-n}} = \frac{\alpha + \beta^n}{\frac{1}{\alpha} + \frac{1}{\beta^n}} = \alpha\beta = 4$

$n = 2$, then $\frac{\alpha^2 + \beta^2}{\alpha^{-2} + \beta^{-2}} = \alpha^2\beta^2 = 4^2$

$n = 3$, then $\frac{\alpha^3 + \beta^3}{\frac{1}{\alpha^3} + \frac{1}{\beta^3}} = \alpha^3\beta^3 = 4^3$

So, for n, solution is 4^n

Q NO. 6

Among 150 faculty members in an institute, 55 are connected with each other through Facebook® and 85 are connected through WhatsApp®. 30 faculty members do not have Facebook® or WhatsApp® accounts. The number of faculty members connected only through Facebook® accounts is _____.

(A) 35 (B) 45 (C) 65 (D) 90

[Ans. A]

Q NO. 7

Computers were invented for performing only high-end useful computations. However, it is no understatement that they have taken over our world today. The internet, for example, is ubiquitous. Many believe that the internet itself is an unintended consequence of the original invention. With the advent of mobile computing on our phones, a whole new dimension is now enabled. One is left wondering if all these developments are good or, more importantly, required.

Which of the statement(s) below is/are logically valid and can be inferred from the above paragraph?

(i) The author believes that computers are not good for us.
(ii) Mobile computers and the internet are both intended inventions

(A) (i) only (B) (ii) only (C) both (i) and (ii) (D) neither (i) nor (ii)

[Ans. D]

Q NO. 8

All hill-stations have a lake. Ooty has two lakes.

Which of the statement(s) below is/are logically valid and can be inferred from the above sentences?

(i) Ooty is not a hill-station.
(ii) No hill-station can have more than one lake.

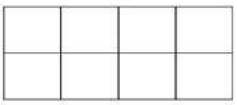
(A) (i) only (B) (ii) only

(C) both (i) and (ii) (D) neither (i) nor (ii)

[Ans. D]

Q NO. 9

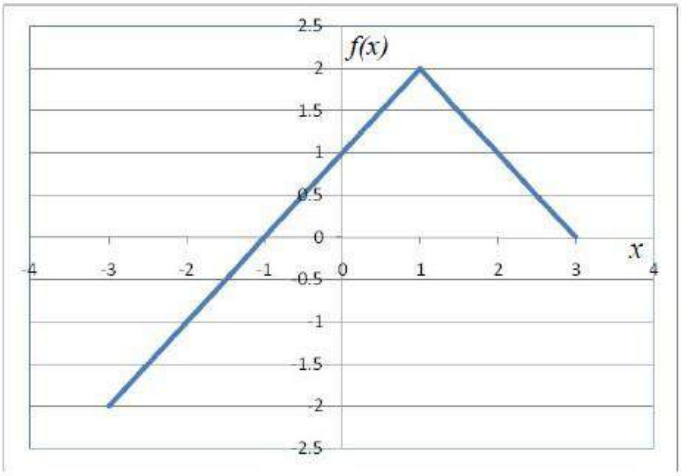
In a 2 × 4 rectangle grid shown below, each cell is a rectangle. How many rectangles can be observed in the grid?



(A) 21 (B) 27 (C) 30 (D) 36

[Ans. C]

Q NO. 10

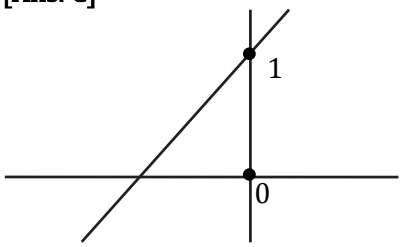


Choose the correct expression for *f(x)* given in the graph.

(A) $f(x) = 1 - |x - 1|$ (B) $f(x) = 1 + |x - 1|$

(C) $f(x) = 2 - |x - 1|$ (D) $f(x) = 2 + |x - 1|$

[Ans. C]



At x = 0 f(0) = 1
Put x = 0 in all options. You will get
$f(x) = 2 - |x - 1| = 1|_{x=0}$
Rest of the option do not match

Section: Technical

Q NO. 1

The maximum value attained by the function $f(x) = x(x-1)(x-2)$ in the interval [1, 2] is _____.

[Ans. *]Range: 0 to 0

$f(x) = x(x-1)(x-2)$

Put $x = 1$ $f(x) = 0$

$x = 2$ $f(x) = 0$

$x = 1.5$ $f(x) < 0$

For all values of x between 1 and 2 (Excluding 1 and 2) f(x) is less than zero.

Thus maximum value attained by f(x) is 0

Q NO. 2

Consider a 3×3 matrix with every element being equal to 1. Its only non-zero eigenvalue is ____.

[Ans. *]Range: 3 to 3

$$A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$

$$|A - \lambda I| = \begin{vmatrix} 1-\lambda & 1 & 1 \\ 1 & 1-\lambda & 1 \\ 1 & 1 & 1-\lambda \end{vmatrix} = 0$$

$$\Rightarrow \begin{vmatrix} 1-\lambda & 0 & 1 \\ 1 & -\lambda & 1 \\ 1 & \lambda & 1-\lambda \end{vmatrix} = 0 \qquad [C_2 = C_2 - C_3]$$

$\Rightarrow (1-\lambda)[-\lambda(1-\lambda) - \lambda] + (\lambda + \lambda) = 0$

$\Rightarrow (1-\lambda)(\lambda^2 - 2\lambda) + 2\lambda = 0$

$\Rightarrow \lambda[(1-\lambda)(\lambda - 2) + 2] = 0$

$\Rightarrow \lambda[-\lambda^2 + 3\lambda] = 0$

$\Rightarrow \lambda^2(\lambda - 3) = 0$

$\Rightarrow \lambda = 3$

Q NO. 3

The Laplace Transform of $f(t) = e^{2t}\sin(5t)\,u(t)$ is

(A) $\frac{5}{s^2-4s+29}$ (B) $\frac{5}{s^2+5}$ (C) $\frac{s-2}{s^2-4s+29}$ (D) $\frac{5}{s+5}$

[Ans. A]

$f(t) = e^{2t}\sin 5t\, u(t)$

We know $L[\sin at\,] = \frac{a}{s^2 + a^2}$

$L[e^{at}f(t)] = f(s-a)$

Thus, $L[\sin 5(t)u(t)] = \frac{5}{s^2 + 5^2}$

$$L[e^{2t}\sin 5t\, u(t)] = \frac{5}{s^2 - 4s + 29}$$

: -

Q NO. 4

A function $y(t)$, such that $y(0) = 1$ and $y(1) = 3e^{-1}$, is a solution of the differential equation $\frac{d^2y}{dt^2} + 2\frac{dy}{dt} + y = 0$. Then $y(2)$ is

(A) $5e^{-1}$ (B) $5e^{-2}$ (C) $7e^{-1}$ (D) $7e^{-2}$

[Ans. B]

$\frac{d^2y}{dt^2} + 2\frac{dy}{dt} + y = 0$

$\Rightarrow (D^2 + 2D + 1) = 0$

$\Rightarrow D = -1, -1$

$\therefore y = (C_1 t + C_2)e^{-t}$

Putting $t = 0, y(0) = 1, C_2 = 1$

$t = 1, y(s) = (C_1 + C_{2e^{-t}} = 3e^{-t}$

$C_2 = 1, C_1 = 2$

$y(z) = (2.2 + 1)e^{-2}$

$= 5e^{-2}$

Q NO. 5

The value of the integral

$$\oint_C \frac{2z + 5}{\left(z - \frac{1}{2}\right)(z^2 - 4z + 5)} dz$$

over the contour $|z| = 1$, taken in the anti-clockwise direction, would be

(A) $\frac{24\pi i}{13}$ (B) $\frac{48\pi i}{13}$ (C) $\frac{24}{13}$ (D) $\frac{12}{13}$

[Ans. B]

Singlarilies, $Z = \frac{1}{2}, 2 \pm i$

Only $Z = \frac{1}{2}$ lies inside C

By residue theorem

$\oint_c 2\pi(R_{1/2}) = \frac{48\pi i}{13}$

$$\text{Residue at} \frac{1}{2} = R_{1/2} = \lim_{z \to \frac{1}{2}} \left[\left(Z - 1/2. \frac{2Z + 5}{\left(Z - \frac{1}{2}\right)(Z^2 + 4Z + 5)} \right) \right] = \frac{24}{13}$$

Q NO. 6

The transfer function of a system is $\frac{Y(s)}{R(s)} = \frac{s}{s+2}$. The steady state output $y(t)$ is $A\cos(2t+\varphi)$ for the input $\cos(2t)$. The values of A and φ, respectively are

(A) $\frac{1}{\sqrt{2}}, -45^\circ$ (B) $\frac{1}{\sqrt{2}}, +45^\circ$ (C) $\sqrt{2}, -45^\circ$ (D) $\sqrt{2}, +45^\circ$

[Ans. B]

$y(s) = \frac{s}{s+2}$ (s/m)

$r(t) = \cos t$ (i/P)

Output $\Rightarrow y(t) = A\cos(2t + \Psi)$

$\Psi = 0$ Phase angles

$\omega = 2$

$y(t) = 1 \times \frac{\omega}{\sqrt{\omega^2+4}}\cos(2t + \theta \pm \phi)$

$\phi = 90 - \tan^{-1}\frac{\omega}{2}$

$= 90 - \tan^{-1}\frac{2}{2}$

$\phi = 45°$

$\therefore Y(t) = \frac{2}{\sqrt{8}}\cos(2t + 45)$

$\Psi = 45$

$A = \frac{2}{\sqrt{8}} = \frac{2}{2\sqrt{2}} = \frac{1}{\sqrt{2}}$

$$A = \frac{1}{\sqrt{2}} \; ; \; \Psi = 45$$

Q NO. 7

The phase cross-over frequency of the transfer function $G(s) = \frac{100}{(s+1)^3}$ in rad/s is

(A) $\sqrt{3}$ (B) $\frac{1}{\sqrt{3}}$ (C) 3 (D) $3\sqrt{3}$

[Ans. A]

$C(s) = \frac{100}{(s+1)^3}$

$= \frac{10}{(1+j\omega)^3}$

$\angle G(j\omega) = -3\tan^{-1}(\omega)$

$\therefore$ Phase cross over frequency $(\omega_p) \Rightarrow -3\tan^{-1}(\omega_p) = -180°$

$\Rightarrow \tan^{-1}(\omega_p) = 60°$

$\Rightarrow \omega_p = \tan 60° = \sqrt{3}$

Q NO. 8

Consider a continuous-time system with input $x(t)$ and output $y(t)$ given by

$$y(t) = x(t)\cos(t)$$

This system is

(A) linear and time-invariant
(B) non-linear and time-invariant
(C) linear and time-varying
(D) non-linear and time-varying

[Ans. C]

$y(t) = x_1(t)\cos(t)$
$y_2(t) = x_2(t)\cos(t)$
$y_3(t) = y_1(t) + y_2(t)$
$= x_1(t)\cos t + x_2(t)\cos t$
$= [x_1(t) + x_2(t)]\cos(t)$

Q NO. 9

The value of $\int_{-\infty}^{+\infty} e^{-t}\,\delta(2t-2)\,dt$, where $\delta(t)$ is the Dirac delta function, is

(A) $\frac{1}{2e}$ (B) $\frac{2}{e}$ (C) $\frac{1}{e^2}$ (D) $\frac{1}{2e^2}$

[Ans. A]

We know $\delta(at) = \frac{1}{|a|}\delta(t)$

$\int_{-\infty}^{\infty} e^{-t}\delta(2t-2)dt$

$= \frac{1}{2}\int_{-\infty}^{\infty} e^{-t}\delta(t-2)dt$

$= \frac{1}{2}e^{-t} = \frac{1}{2e}$

Q NO. 10

A temperature in the range of -40° C to 55° C is to be measured with a resolution of 0.1° C. The minimum number of ADC bits required to get a matching dynamic range of the temperature sensor is

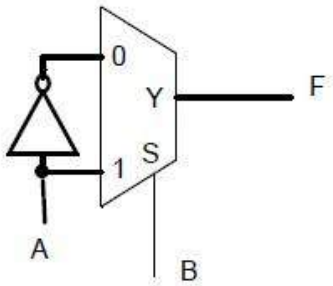
(A) 8 (B) 10 (C) 12 (D) 14

[Ans. B]

Temperature range pf -40℃to 55℃
So total range in 95℃
Since resolution 0.1℃
So number of steps will be 950
To have 950 steps we need at least 10 bits

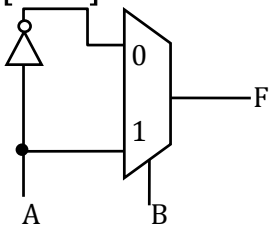
Q NO. 11

Consider the following circuit which uses a 2-to-1 multiplexer as shown in the figure below. The Boolean expression for output F in terms of A and B is



(A) $A \oplus B$ (B) $\overline{A+B}$ (C) $A+B$ (D) $\overline{A \oplus B}$

[Ans. D]



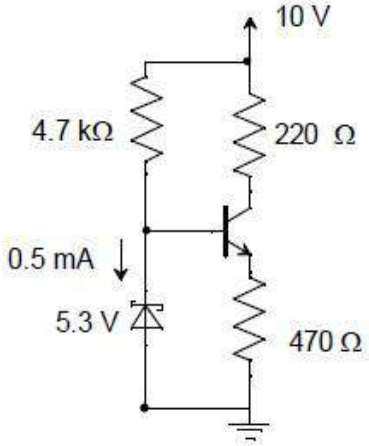
$B = 1; F = A$

$B = 0; F = \overline{A}$

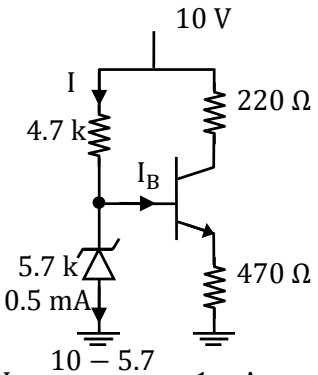
$\therefore F = AB + \overline{A}\overline{B} = \overline{A \oplus B}$

Q NO. 12

A transistor circuit is given below. The Zener diode breakdown voltage is 5.3 V as shown. Take base to emitter voltage drop to be 0.6 V. The value of the current gain β is _____.



[Ans. *]Range: 18 to 20



$$I = \frac{10 - 5.7}{4.7k} = 1\ mA$$
$$\therefore I_B = (1 - 0.5)mA$$
$$= 0.5\ mA$$
$$I_E = \frac{5.7 - 0.6}{470} = 10\ mA$$
$$\therefore I_E = I_B + I_C \Rightarrow I_C = 9.5\ mA$$
$$\therefore \beta = \frac{I_C}{I_B} = \frac{9.5}{0.5} = 19$$

Q NO. 13

In cylindrical coordinate system, the potential produced by a uniform ring charge is given by $\varphi = f(r, z)$, where f is a continuous function of r and z. Let $\vec{E}$ be the resulting electric field. Then the magnitude of $\nabla \times \vec{E}$

(A) increases with r. (B) is 0. (C) is 3. (D) decreases with z.

[Ans. B]

V is given as static field in time invariant

Hence $\nabla \times E = 0$

Q NO. 14

A soft-iron toroid is concentric with a long straight conductor carrying a direct current I. If the relative permeability μ_r of soft-iron is 100, the ratio of the magnetic flux densities at two adjacent points located just inside and just outside the toroid, is _____.

[Ans. *]Range: 99 to 101

Toroid has field $B \propto \mu$

As $\mu = 100$ (inside field)

Magnetic field density B at any point at a distance at r is

$$B = \frac{\mu L}{2\pi r}$$

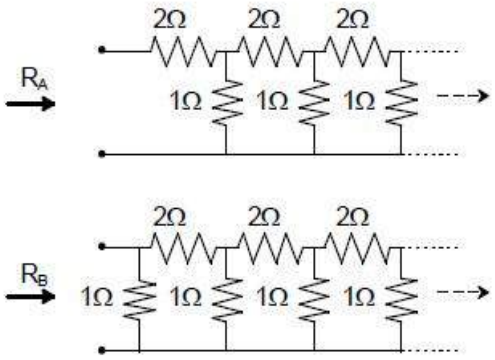
Now, $B_{at\ r^-} = \frac{\mu_0 \mu_r I}{2\pi r^-}$ (Just inside toriod)

and $B_{at\ r^+} = \frac{\mu_0 I}{2\pi r^+}$ (Just outside toriod)

$$\frac{B_{at\ r^-}}{B_{at\ r^+}} = \mu_r = 100$$

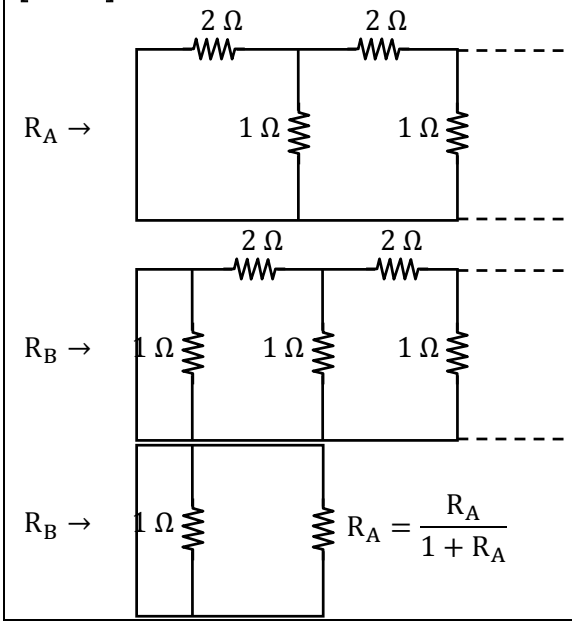
Q NO. 15

R_A and R_B are the input resistances of circuits as shown below. The circuits extend infinitely in the direction shown. Which one of the following statements is TRUE?



(A) $R_A=R_B$ (B) $R_A=R_B=0$ (C) $R_A< R_B$ (D) $R_B= R_A /(1+R_A)$

[Ans. D]



Q NO. 16

In a constant V/f induction motor drive, the slip at the maximum torque

(A) is directly proportional to the synchronous speed.
(B) remains constant with respect to the synchronous speed.
(C) has an inverse relation with the synchronous speed.
(D) has no relation with the synchronous speed.

[Ans. C]

f_0 = Nominal frequency

$\omega_s = \left(\frac{f}{f_0}\right) \omega_{s_0}$ .... (i)

$S_{max,T} = \left(\frac{f_0}{f}\right)\left(\frac{R_2}{X_{20}^I}\right)$ .... (ii)

From (i) and (ii)

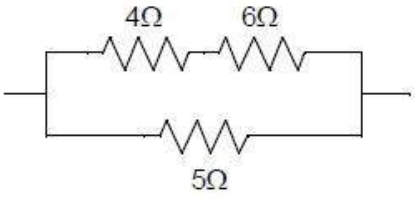
$S_{max,T} = \left(\frac{\omega_{s_0}}{\omega_s}\right) \cdot \left(\frac{R_2}{X_{20}^I}\right)$

$S_{max,T} = \left(\frac{\omega_{s_0}}{\omega_s}\right) \cdot \left(\frac{R_2}{X_{20}^I}\right)$

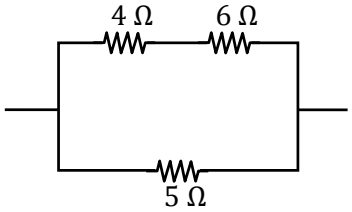
$S_{max,T} = \frac{1}{\omega_s}$

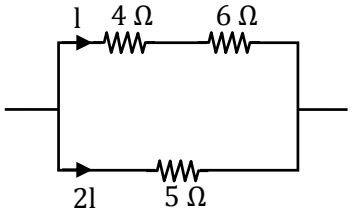
Q NO. 17

In the portion of a circuit shown, if the heat generated in 5 Ω resistance is 10 calories per second, then heat generated by the 4 Ω resistance, in calories per second, is _____.



[Ans. *]Range: 1.9 to 2.1





And

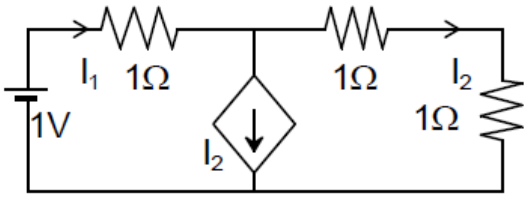
$(2I)^2 \times 5 = 10$

$\Rightarrow I^2 = \frac{10}{5 \times 4} = \frac{2.5}{5} = 0.5$

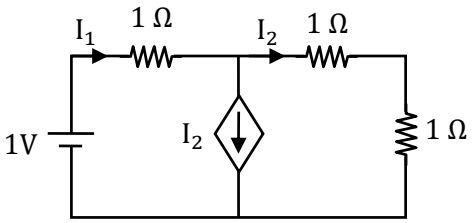
So, $I^2 \times 4 = 0.5 \times 4 = 2$ cal/sec

Q NO. 18

In the given circuit, the current supplied by the battery, in ampere, is _____.



[Ans. *] Range: 0.5 to0.5



Here, $I_1 = 2I_2 = 1A$

$\Rightarrow I_2 = \frac{1}{2}A = 0.5$

Q NO. 19

In a 100 bus power system, there are 10 generators. In a particular iteration of Newton Raphson load flow technique (in polar coordinates), two of the PV buses are converted to PQ type. In this iteration,

(A) the number of unknown voltage angles increases by two and the number of unknown voltage magnitudes increases by two.
(B) the number of unknown voltage angles remains unchanged and the number of unknown voltage magnitudes increases by two.
(C) the number of unknown voltage angles increases by two and the number of unknown voltage magnitudes decreases by two.
(D) the number of unknown voltage angles remains unchanged and the number of unknown voltage magnitudes decreases by two.

[Ans. B]

Q NO. 20

The magnitude of three-phase fault currents at buses A and B of a power system are 10 pu and 8 pu, respectively. Neglect all resistances in the system and consider the pre-fault system to be unloaded. The pre-fault voltage at all buses in the system is 1.0 pu. The voltage magnitude at bus B during a three-phase fault at bus A is 0.8 pu. The voltage magnitude at bus A during a three-phase fault at bus B, in pu, is _____.

[Ans. *] Range: 0.83 to 0.85

Q NO. 21

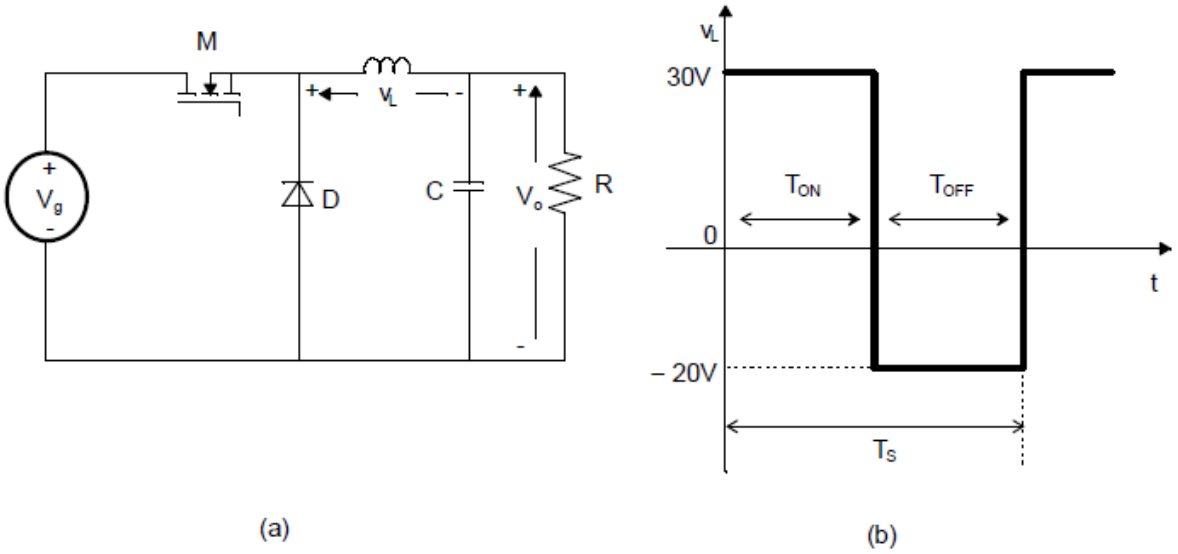
Consider a system consisting of a synchronous generator working at a lagging power factor, a synchronous motor working at an overexcited condition and a directly grid-connected induction generator. Consider capacitive VAr to be a source and inductive VAr to be a sink of reactive power. Which one of the following statements is TRUE?

(A) Synchronous motor and synchronous generator are sources and induction generator is a sink of reactive power.
(B) Synchronous motor and induction generator are sources and synchronous generator is a sink of reactive power.
(C) Synchronous motor is a source and induction generator and synchronous generator are sinks of reactive power.
(D) All are sources of reactive power.

[Ans. A]
Synchronous generator working at a lagging power factor, will supply active power and lagging reactive power, so this is source
Synchronous motor working at an overexcited condition i.e., leading p.f. operation so it will take active supplying lagging reactive power.
Induction generator generates active power but as there is no dc excitation in rotor so it takes lagging reactive power.

Q NO. 22

A buck converter, as shown in Figure (a) below, is working in steady state. The output voltage and the inductor current can be assumed to be ripple free. Figure (b) shows the inductor voltage v_L during a complete switching interval. Assuming all devices are ideal, the duty cycle of the buck converter is _____.

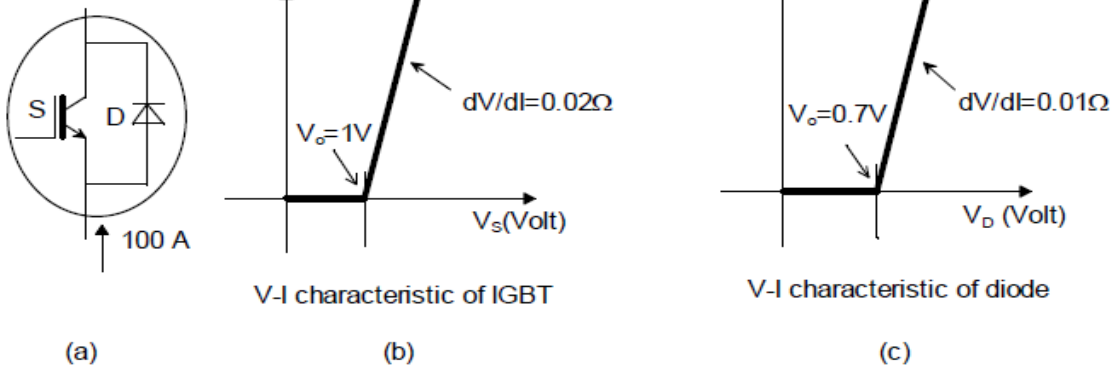


[Ans. *]Range: 0.39 to 0.41
Average voltage across inductor is zero.
$V_{L(Avg)} = 0$
$30(T_{ON}) - 20(T_{OFF}) = 0$

$30(\alpha T) = 20(1-\alpha)T$
$30\alpha + 2\alpha = 20$
$50\alpha = 20$
$\alpha = \frac{2}{5} = 0.4$

Q NO. 23

A steady dc current of 100 A is flowing through a power module (S, D) as shown in Figure (a). The V-I characteristics of the IGBT (S) and the diode (D) are shown in Figures (b) and (c), respectively. The conduction power loss in the power module (S, D), in watts, is _____.



V-I characteristic of IGBT

V-I characteristic of diode

(a) (b) (c)

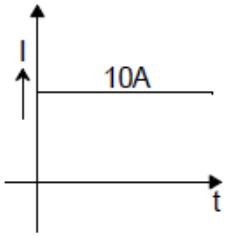
[Ans. *]Range: 169 to 171

$I_D = \frac{1}{0.01} V_D$
$V_D = 0.01\, I_D + 0.7 = 1.7\ V \quad (y = mx + c)$
$I_D = \frac{V_D}{0.01} = \frac{0.7}{0.01}$
$P = V_D I_D = 1.7\left(\frac{1.7}{0.04} - \frac{0.7}{0.01}\right)$
$P = 170\ W$

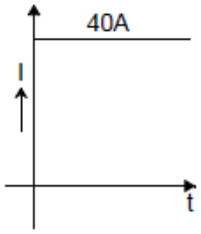
Q NO. 24

A 4-pole, lap-connected, separately excited dc motor is drawing a steady current of 40 A while running at 600 rpm. A good approximation for the waveshape of the current in an armature conductor of the motor is given by

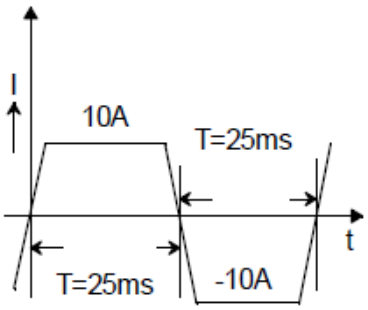
(A)



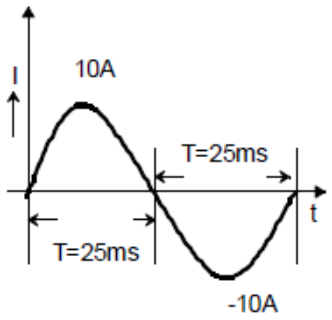
(B)



(C)



(D)



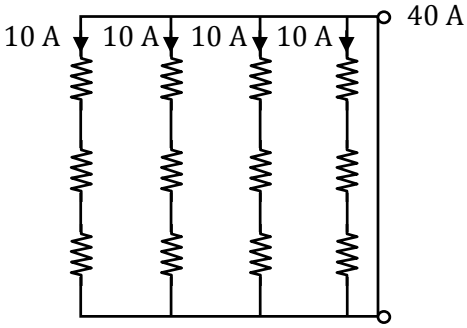
[Ans. C]

4 pole, lap-connected separately excited dc motor, N = 6000 rpm

Parallel path = 4 = Number of poles

Current in each parallel path = $\frac{40}{4}$ 10A

Current in aramture conductor = 10A



Speed = 600 rpm

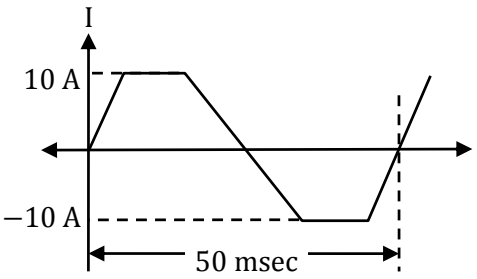
$N = \frac{120 \times f}{4} = 600$

$f = \frac{600 \times 4}{120} = 20$ Hz

Time period, $T = \frac{1}{f} = \frac{1}{20}$

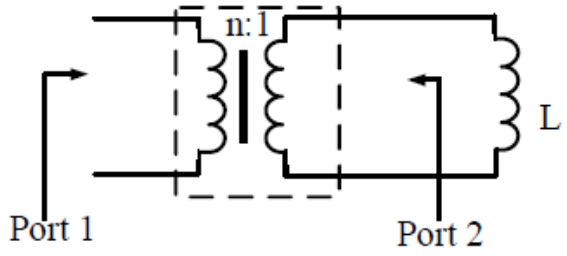
$= 50$ msec

So,



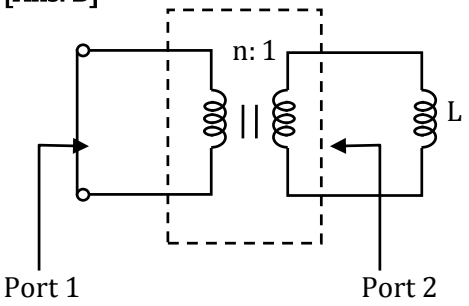
Q NO. 25

If an ideal transformer has an inductive load element at port 2 as shown in the figure below, the equivalent inductance at port 1 is



(A) nL (B) n^2L (C) $\frac{n}{L}$ (D) $\frac{n^2}{L}$

[Ans. B]



At port 1 i.e, high voltage side impedance will be high and current will be low, So n^2L.

Q NO. 26

Candidates were asked to come to an interview with 3 pens each. Black, blue, green and red were the permitted pen colours that the candidate could bring. The probability that a candidate comes with all 3 pens having the same colour is _____.

[Ans. *] Range: 0.2 to 0.2

Q NO. 27

Let $S = \sum_{n=0}^{\infty} n\alpha^n$ where $|\alpha| < 1$. The value of α in the range $0 < \alpha < 1$, such that $S = 2\alpha$ is _____.

[Ans. *] Range: 0.28 to 0.31

$$S = \sum_{n=0}^{\infty} n\ \alpha^n$$

$$\Rightarrow S = \frac{1}{\alpha} + \frac{2}{\alpha^2} + \frac{3}{\alpha^3} + \frac{4}{\alpha^4} + \cdots$$

$$\Rightarrow S\frac{1}{\alpha} = \frac{1}{\alpha^2} + \frac{2}{\alpha^3} + \frac{3}{\alpha^4} + \cdots$$

$S\left(1-\frac{1}{\propto}\right)=\frac{1}{\propto}+\frac{1}{\propto^2}+\frac{2}{\propto^3}+\frac{3}{\propto^4}+\cdots$

$\Rightarrow S\left(\frac{\propto-1}{\propto}\right)=\frac{1}{\propto}\frac{1}{1-\frac{1}{\propto}}$

$\Rightarrow S=\frac{\propto}{(\propto-1)^2}$

According to question $S=2\propto$

Thus, $2\propto=\frac{\propto}{(\propto-1)^2}\Rightarrow(\propto-1)^2=\frac{1}{2}$

$\Rightarrow\propto=1\pm\frac{1}{\sqrt{2}}$

$0<\propto<1$

So, $\propto=1-\frac{1}{\sqrt{2}}=0.29$

Q NO. 28

Let the eigenvalues of a 2 x 2 matrix A be 1, -2 with eigenvectors x_1 and x_2 respectively. Then the eigenvalues and eigenvectors of the matrix $A^2-3A+4I$ would, respectively, be

(A) 2, 14; x_1, x_2
(B) 2, 14; x_1+x_2, x_1-x_2
(C) 2, 0; x_1, x_2
(D) 2, 0; x_1+x_2, x_1-x_2

[Ans. A]

Eigen values of 2×2 matrix A be $1,-2$
Eigen values of A^2 matrix A be $1,4$
Eigen values of 3A matrix A be $3,-6$
Eigen values of 4I matrix A be 4
$\therefore$ Eigen values of $A^2-3A+4I$ be $2,14$; Eigen vectors of $A^2-3A+4I$ be same as A

Q NO. 29

Let A be a 4×3 real matrix with rank 2. Which one of the following statement is TRUE?

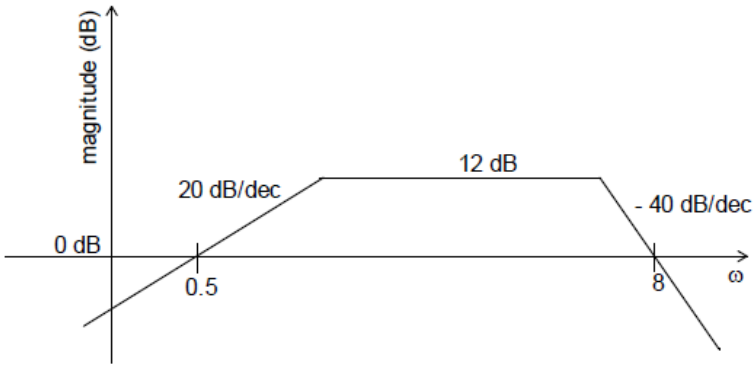
(A) Rank of A^TA is less than 2.
(B) Rank of A^TA is equal to 2.
(C) Rank of A^TA is greater than 2.
(D) Rank of A^TA can be any number between 1 and 3.

[Ans. B]

Result
Rank (A^TA) = Rank (A)

Q NO. 30

Consider the following asymptotic Bode magnitude plot (ω is in rad/s).



Which one of the following transfer functions is best represented by the above Bode magnitude plot?

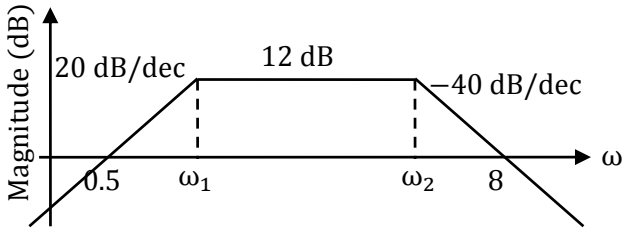
(A) $\frac{2s}{(1+0.5s)(1+0.25s)^2}$

(B) $\frac{4(1+0.5s)}{s(1+0.25s)}$

(C) $\frac{2s}{(1+2s)(1+4s)}$

(D) $\frac{4s}{(1+2s)(1+4s)^2}$

[Ans. A]



For measuring ω_1, $0 - 12 = 20[\log 0.5 - \log \omega_1]$

$\Rightarrow -\frac{12}{20} = \log\frac{0.5}{\omega_1}$; $\Rightarrow \omega_1 = 2$

For measuring ω_2, $12 - 0 = -40(\log \omega_2 - \log 8)$

$\Rightarrow -\frac{12}{40} = \log\frac{\omega_2}{8}$; $\Rightarrow \omega_2 = 4$

Initial slope is 20 dB/dec, thus in numerator jω term will be there.

From point ω_1, slope decreased to 0, i.e., −20 dB/dec applied. So, in denominator $\frac{1}{\left(1+\frac{1}{2}s\right)}$ term will be there

From point ω_2, slope is -40 dB/dec. Thus in denominator $\frac{1}{\left(1+\frac{1}{4}s\right)^2}$ term will be there.

$\therefore$ Thus, transfer function looks like $\propto \frac{s}{(1+0.5s)(1+0.25s)^2}$

Q NO. 31

Consider the following state-space representation of a linear time-invariant system.

$$\dot{\boldsymbol{x}}(t) = \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix} \boldsymbol{x}(t), \quad y(t) = \boldsymbol{c}^{\mathrm{T}}\boldsymbol{x}(t), \quad \boldsymbol{c} = \begin{bmatrix} 1 \\ 1 \end{bmatrix} \text{ and } \boldsymbol{x}(0) = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

The value of $y(t)$ for $t = \log_e 2$ is _____.

[Ans. *]Range: 5.9 to 6.1

The time response is given by

$x(t) = \phi(t)x(0)$; Where, $\phi(t) = L^{-1}(sI - A)^{-1}$

$$(sI - A) = \begin{bmatrix} s & 0 \\ 0 & s \end{bmatrix} - \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix} = \begin{bmatrix} s-1 & 0 \\ 0 & s-2 \end{bmatrix}$$

$$\phi(s) = (sI - A)^{-1} = \frac{1}{(s-1)(s-2)} \begin{bmatrix} s-2 & 0 \\ 0 & s-1 \end{bmatrix}$$

$$\phi(s) = \begin{bmatrix} \frac{1}{s-1} & 0 \\ 0 & \frac{1}{s-2} \end{bmatrix}$$

$$\Rightarrow \phi(t) = \begin{bmatrix} e^{t} & 0 \\ 0 & e^{2t} \end{bmatrix}$$

$$x(t) = \begin{bmatrix} e^{t} & 0 \\ 0 & e^{2t} \end{bmatrix}_{2\times 2} \begin{bmatrix} 1 \\ 1 \end{bmatrix}_{2\times 2} = \begin{bmatrix} e^{t} \\ e^{2t} \end{bmatrix}$$

$$\Rightarrow y(t) = \begin{bmatrix} 1 & 1 \end{bmatrix} \begin{bmatrix} e^{t} \\ e^{2t} \end{bmatrix} = e^{t} + e^{2t}; \Rightarrow y(t) = e^{\log 2} + e^{2\log_e 2}\Big|_{t=\log_2 e} = 6$$

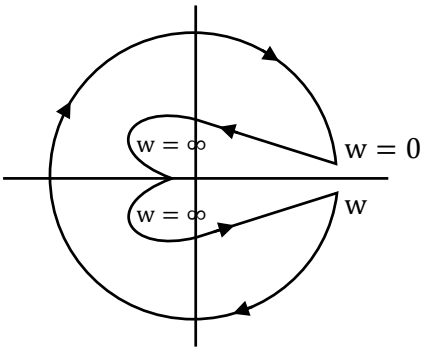
Q NO. 32

Loop transfer function of a feedback system is $G(s)H(s) = \dfrac{s+3}{s^2(s-3)}$. Take the Nyquist contour in the clockwise direction. Then, the Nyquist plot of $G(s)H(s)$ encircles $-1 + j0$

(A) once in clockwise direction
(B) twice in clockwise direction
(C) once in anticlockwise direction
(D) twice in anticlockwise direction

[Ans. A]

Nyquist plot of $G(s)H(s) = \dfrac{s+3}{s^2(s-3)}$ is as shown below



From the Nyquist plot G(s) H(s) encircle $-1 + j0$ once in clockwise direction.

Q NO. 33

Given the following polynomial equation

$$s^3 + 5.5\,s^2 + 8.5\,s + 3 = 0,$$

the number of roots of the polynomial, which have real parts strictly less than -1, is _____ .

[Ans. *]Range: 2 to 2

$s^3 + 5.5s^2 + 8.5s + 3 = 0$

$\Rightarrow s^3 + 3s^2 + 2.5s^2 + 7.5s + 1s + 3 = 0$

$\Rightarrow (s+3)(s^2 + 2.5s + 1) = 0$

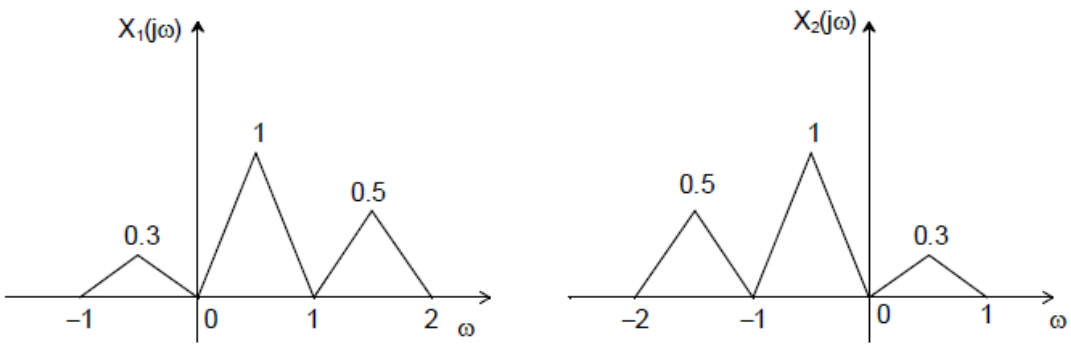
$= -3, \dfrac{-2.5 \pm 1.5}{2}$

$= -3, -2, -\dfrac{1}{2}$

So, roots strictly less than -1 is -2 and -3.

Q NO. 34

Suppose $x_1(t)$ and $x_2(t)$ have the Fourier transforms as shown below.



Which one of the following statements is TRUE?

(A) $x_1(t)$ and $x_2(t)$ are complex and $x_1(t)x_2(t)$ is also complex with nonzero imaginary part
(B) $x_1(t)$ and $x_2(t)$ are real and $x_1(t)x_2(t)$ is also real
(C) $x_1(t)$ and $x_2(t)$ are complex but $x_1(t)x_2(t)$ is real
(D) $x_1(t)$ and $x_2(t)$ are imaginary but $x_1(t)x_2(t)$ is real

[Ans. C]

By observing $X_1(j\omega)$ and $X_2(j\omega)$ we can say that they are not conjugate symmetric. Sin ce the Fourier transform is not conjugate symmetric the signal will not be real

So, $x_1(t).x_2(t)$ are not real.

Now the Fourier transform of $x_1(t) \cdot x_2(t)$ will be $\frac{1}{2\pi} X_1(j\omega) * X_2(j\omega)$ and by looking at $X_1(j\omega)$ and $X_2(j\omega)$ $X_1(j\omega) \times X_2(j\omega)$ will be conjugate symmetric and thus, $x_1(t) \cdot x_2(t)$ will be real

Q NO. 35

The output of a continuous-time, linear time-invariant system is denoted by $\boldsymbol{T}\{x(t)\}$ where $x(t)$ is the input signal. A signal $z(t)$ is called eigen-signal of the system $\boldsymbol{T}$, when $\boldsymbol{T}\{z(t)\} = \gamma\, z(t)$, where γ is a complex number, in general, and is called an eigenvalue of $\boldsymbol{T}$. Suppose the impulse response of the system $\boldsymbol{T}$ is real and even. Which of the following statements is TRUE?

(A) $\cos(t)$ is an eigen-signal but $\sin(t)$ is not
(B) $\cos(t)$ and $\sin(t)$ are both eigen-signals but with different eigenvalues
(C) $\sin(t)$ is an eigen-signal but $\cos(t)$ is not
(D) $\cos(t)$ and $\sin(t)$ are both eigen-signals with identical eigenvalues

[Ans. D]

Given that impulse response is real and even, Thus H(jω) will also be real and even

$e^{j\omega_0 t} \rightarrow$ [LTI System] $\rightarrow H(j\omega_0)e^{j\omega_0 t}$

$e^{-j\omega_0 t} \rightarrow$ [LTI System] $\rightarrow H(-j\omega_0)e^{-j\omega_0 t}$

Since $H(j\omega)$ is real and even thus $H(j\omega_0) = H(-j\omega_0)$

Now cos(t)is input i. e., $\frac{e^{jt} + e^{-jt}}{2}$ is input

Output will be $\frac{H(j1)e^{jt} + H(-j\omega)e^{-jt}}{2} = H(j1)\left[\frac{e^{jt} + e^{-jt}}{2}\right] = H(j1)\cos(t)$

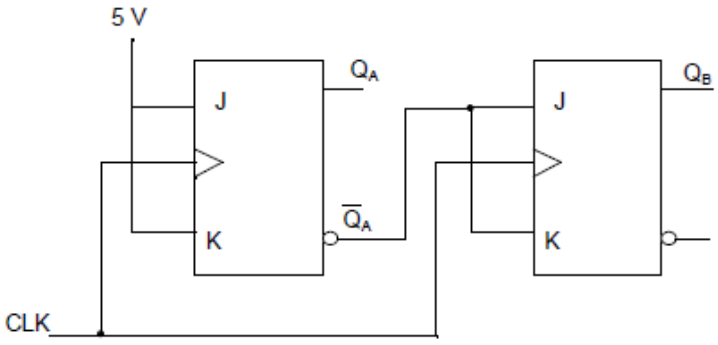
If sin(t)is input i. e., $\frac{e^{jt} - e^{-jt}}{2}$ is input

Output will be $\frac{H(j1)e^{jt} - H(-j\omega)e^{-jt}}{2} = H(j1)\left[\frac{e^{jt} - e^{-jt}}{2}\right] = H(j1)\sin(t)$

So sin(t)and cos(t)are Eigen signals with same Eigenvalues.

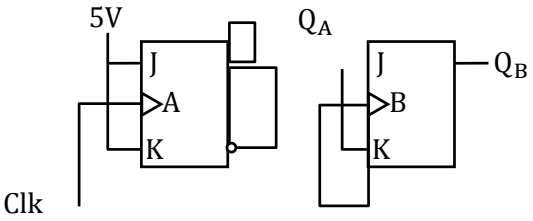
Q NO. 36

The current state Q_A Q_B of a two JK flip-flop system is 00. Assume that the clock rise-time is much smaller than the delay of the JK flip-flop. The next state of the system is



(A) 00 (B) 01 (C) 11 (D) 10

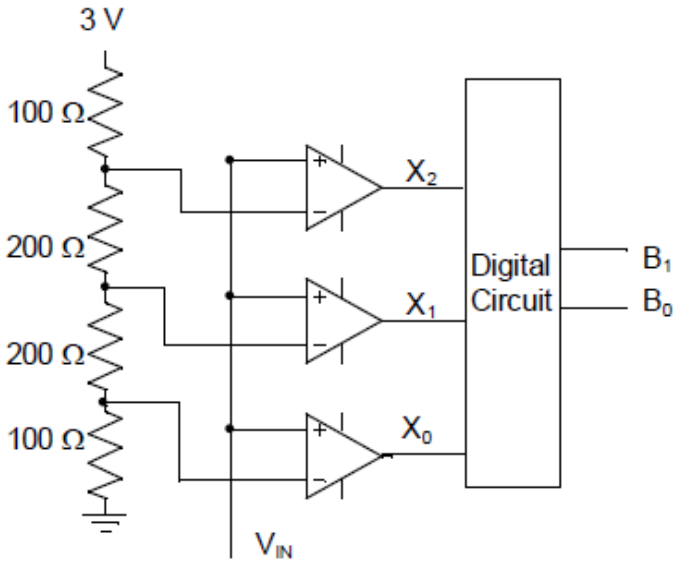
[Ans. C]



Next when clock applied Q_A toggles as J, K input of A connects to 5 V.
Also, Q_B toggles as previous state $\overline{Q}_A$ values is J which is the input of J, K of B.
Thus, output of next state is 11

Q NO. 37

A 2-bit flash Analog to Digital Converter (ADC) is given below. The input is $0 \leq V_{IN} \leq 3$ Volts. The expression for the LSB of the output B_0 as a Boolean function of X_2, X_1, and X_0 is



(A) $X_0[\overline{X_2 \oplus X_1}]$ (B) $\bar{X}_0[\overline{X_2 \oplus X_1}]$ (C) $X_0[X_2 \oplus X_1]$ (D) $\bar{X}_0[X_2 \oplus X_1]$

[Ans. A]

X_0	X_1	X_2
0	0	0
1	0	0
1	1	0
1	1	1

B_1	B_6
0	0
0	1
1	0
1	1

X_0 \ X_2X_1	00	01	11	10
0	0			
1	1	0	1	

$\therefore X_0[x_2x_1 + \bar{x}_2\,\bar{x}_1]$
$= x_0[\overline{x_1 \oplus x_2}]$

Q NO. 38

Two electric charges q and $-2q$ are placed at (0,0) and (6,0) on the x-y plane. The equation of the zero equipotential curve in the x-y plane is

(A) $x = -2$ (B) $y = 2$ (C) $x^2 + y^2 = 2$ (D) $(x+2)^2 + y^2 = 16$

[Ans. D]

Charge, Q is located at (0, 0) and -2θ is located at (6, 0)

To find V at any point (x, y)

$$V_Q = \frac{Q}{4\pi \in \sqrt{x^2 + y^2}}$$

$$V_{-2Q} = \frac{-2Q}{4\pi \in \left(\sqrt{(x-6)^2 + y^2}\right)}$$

$$V_{total} = 0 = \frac{Q}{4\pi \in \left(\sqrt{x^2 + y^2}\right)} + \frac{-2Q}{4\pi \in \left(\sqrt{(x-6)^2 + y^2}\right)}$$

$$\sqrt{(x-6)^2 + y^2} = 2\left(\sqrt{x^2 + y^2}\right)$$

$$x^2 + 36 - 12x + y^2 = 4x^2 + 4y^2$$

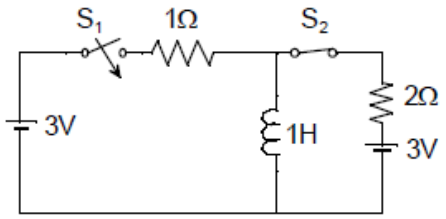
$$3x^2 + 3y^2 + 12x = 36$$

$$x^2 + y^2 + 4x = 12$$

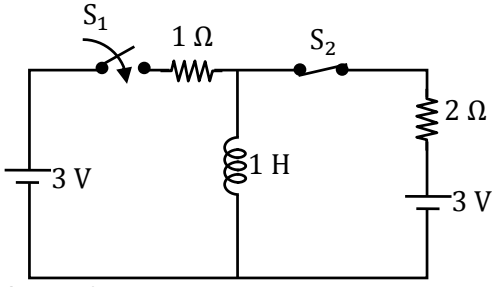
$$(x+2)^2 + y^2 = 16$$

Q NO. 39

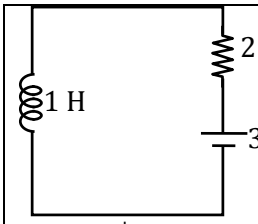
In the circuit shown, switch S_2 has been closed for a long time. At time $t = 0$ switch S_1 is closed. At $t = 0^+$, the rate of change of current through the inductor, in amperes per second, is _____.



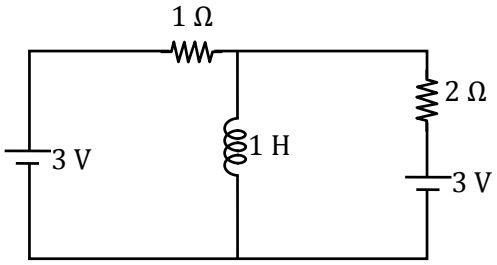
[Ans. *]Range: 1.9 to 2.1



At $t = 0^-$



At $t = 0^+$,



KCL at node A,

$$\frac{V_A - 3}{1} + \frac{3}{2} + \frac{V_A - 3}{2} = 0$$

$$2(V_A - 3) + 3 + (V_A - 3) = 0$$

$$3V_A = 6, V_A = 2$$

$$V_A = L\frac{di(0^+)}{dt} = 2$$

$$\frac{di(0^+)}{dt} = \frac{2}{L} = \frac{2}{1} = 2 \text{ A/sec}$$

Q NO. 40

A three-phase cable is supplying 800 kW and 600 kVAr to an inductive load. It is intended to supply an additional resistive load of 100 kW through the same cable without increasing the heat dissipation in the cable, by providing a three-phase bank of capacitors connected in star across the load. Given the line voltage is 3.3 kV, 50 Hz, the capacitance per phase of the bank, expressed in microfarads, is _____.

[Ans. *] Range: 47 to 49

$KVA_1 = \sqrt{800^2 + 600^2} = 1000$ KVA

Without excessive heat dissipation means current should be constant (i.e.) KVA rating must be constant.

In second case Active power, $P = 800 + 100 = 900$ KW

Reactive power in second case $Q_2 = \sqrt{1000^2 - 900^2} = 435.889$ KVAR

Reactive power supplied by the three phase bank $= 600 - 435.889$

$= 164.11$ KVAR

$$Q_{bank}/ph = \frac{164.11}{3} = 54.7 \text{ KVAR}$$

$$V/ph = \frac{3.3}{\sqrt{3}} = 1.9052 \text{ KV}$$

$$Qc/ph = \frac{(V/ph)^2}{X_c}$$

$X_c = \frac{(1.9052 \times 10^3)^2}{54.7 \times 10^3} = 66.36\ \Omega$

$C = \frac{1}{2\pi f X_c} = \frac{1}{2\pi \times 50 \times 66.36} = 47.96\ \mu$

Q NO. 41

A 30 MVA, 3-phase, 50 Hz, 13.8 kV, star-connected synchronous generator has positive, negative and zero sequence reactances, 15%, 15% and 5% respectively. A reactance (X_n) is connected between the neutral of the generator and ground. A double line to ground fault takes place involving phases 'b' and 'c', with a fault impedance of j0.1 p.u. The value of X_n (in p.u.) that will limit the positive sequence generator current to 4270 A is _____.

[Ans. *] Range: 1.05 to 1.15

Base current $I_B = \frac{30 \times 10^3}{\sqrt{3} \times 13.8} = 1255.109$ A

$I_f = 4270$ A

$I_{p.u.} = \frac{4270}{1255.109} = 3.402$ p. u.

$I_{g1} = \frac{E_a}{X_1 + (X_2 \parallel X_0)}$

Where, $X_0 = X_0 + 3(Z_n + Z_f)$

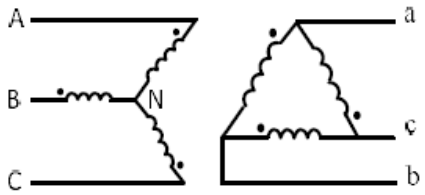
$X_0 = 3Z_n + 0.35$

$3.402 = \frac{1.0}{0.15 + \frac{0.15 \times (3Z_n + 0.35)}{0.15 + 3Z_n + 0.35}}$

By solving the equation $Z_n = 1.07$ p. u.

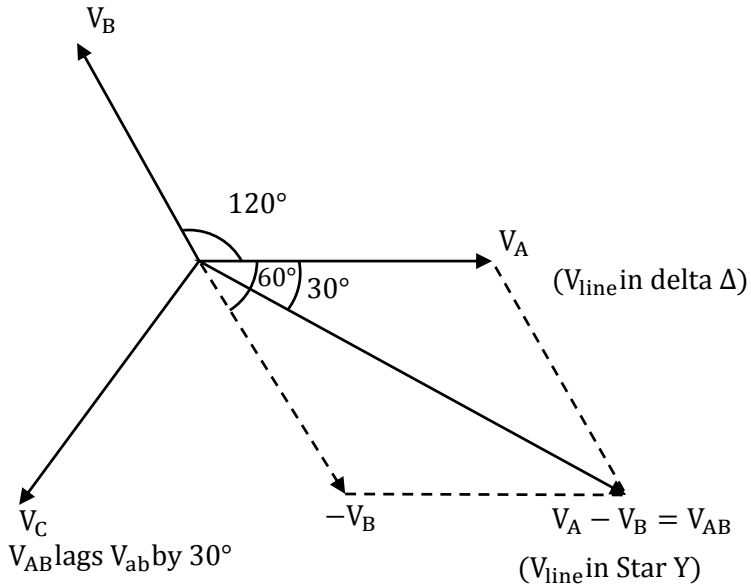
Q NO. 42

If the star side of the star-delta transformer shown in the figure is excited by a negative sequence voltage, then



(A) V_{AB} leads V_{ab} by 60°
(B) V_{AB} lags V_{ab} by 60°
(C) V_{AB} leads V_{ab} by 30°
(D) V_{AB} lags V_{ab} by 30°

[Ans. D]



According to negative sequence phasors

Q NO. 43

A single-phase thyristor-bridge rectifier is fed from a 230 V, 50 Hz, single-phase AC mains. If it is delivering a constant DC current of 10 A, at firing angle of 30°, then value of the power factor at AC mains is

(A) 0.87 (B) 0.9 (C) 0.78 (D) 0.45

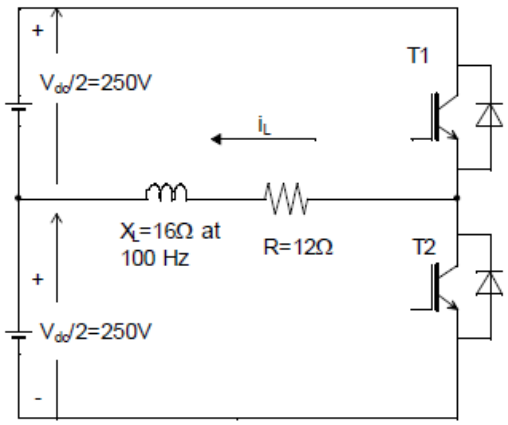
[Ans. C]

Input power factor = Power factor at ac mains = C.D.F. × D.F.

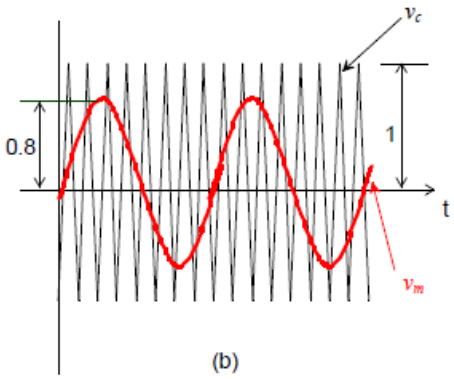
$$= \frac{2\sqrt{2}}{\pi}\cos\alpha = \frac{2\sqrt{2}}{\pi}\cos 30° = 0.78$$

Q NO. 44

The switches T1 and T2 in Figure (a) are switched in a complementary fashion with sinusoidal pulse width modulation technique. The modulating voltage $v_m(t) = 0.8 \sin(200\pi t)$ V and the triangular carrier voltage (v_c) are as shown in Figure (b). The carrier frequency is 5 kHz. The peak value of the 100 Hz component of the load current (i_L), in ampere, is _____ .



(a)



(b)

[Ans. *] Range: 9.9 to 10.1

$m_a = 0.8$

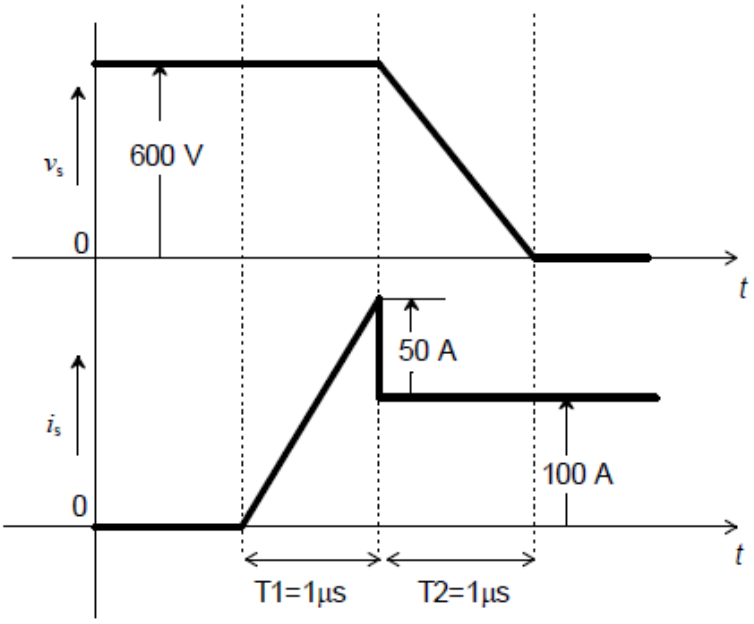
$$(V_{01})_{peak} = m_a \frac{V_d}{2} \qquad [m_a \le 1]$$

$$= 0.8 \times 250 = 200 \text{ V}$$

$$(I_{01})_{peak} = \frac{(V_{01})_{peak}}{Z_1} = \frac{200}{\sqrt{R^2 + (\omega L)^2}} = \frac{200}{\sqrt{12^2 + 16^2}} = 10 \text{ A}$$

Q NO. 45

The voltage (v_s) across and the current (i_s) through a semiconductor switch during a turn-ON transition are shown in figure. The energy dissipated during the turn-ON transition, in mJ, is _____.



[Ans. *] Range: 74 to 76

$$\text{Energy} = \int_0^{T_1} V.i\,dt + \int_0^{T_2} V.i\,dt$$

$$= V\left[\frac{1}{2}IT_1\right] + I\left[\frac{1}{2}VT_2\right]$$

$$= 600\left[\frac{150}{2}\times 1\times 10^{-6}\right] + 100\left[\frac{1}{2}\times 600\times 1\times 10^{-6}\right]$$

$$\text{Energy} = 75\ \text{mJ}$$

Q NO. 46

A single-phase 400 V, 50 Hz transformer has an iron loss of 5000 W at the rated condition. When operated at 200 V, 25 Hz, the iron loss is 2000 W. When operated at 416 V, 52 Hz, the value of the hysteresis loss divided by the eddy current loss is _____.

[Ans. *] Range: 1.4 to 1.5

400 V, 50 Hz transformer,

$P_i = 5000$ Watt

When,

$200\ V, 25\ Hz \Rightarrow Pi = 2000$ Watt

$416\ V, 52\ Hz \Rightarrow \frac{P_h}{P_e} = ?$

$P_i = P_h + P_e$

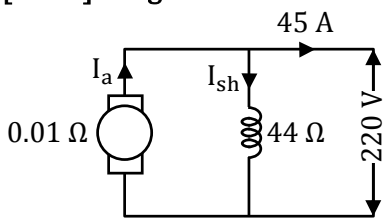
$P_h \propto fB_m^x$

$P_e \propto f^2 B_m^2$
As in the problem
$\frac{V}{f} = \frac{400}{50} = \frac{200}{25} = \frac{416}{52}$
$= 8 = \text{constant}$
$P_h = Af$
And $P_e = Bf^2$
From given data,
$2000 = (P_{25Hz})_i$
$= A(25) + B(25)^2 \ldots\ldots\ldots ①$
$5000 = (P_{50\,Hz})_i$
$= A(50) + B(50)^2 \ldots\ldots\ldots ②$
Solving ① and ②
$A = 60, B = 0.8$
$(P_h)_{52\,Hz} = Af = 60 \times 52$
$= 3120$ Watt
$(P_e)_{52\,Hz} = Bf^2 = 0.8 \times (52)^2$
$= 2163.2$ Watt
$\frac{(P_h)_{52\,Hz}}{(P_e)_{52\,Hz}} = \frac{3120}{2163.2} = 1.4423$

Q NO. 47

A DC shunt generator delivers 45 A at a terminal voltage of 220 V. The armature and the shunt field resistances are 0.01 Ω and 44 Ω respectively. The stray losses are 375 W. The percentage efficiency of the DC generator is _____.

[Ans. *] Range: 86 to 87



Stay losses = 375 Watt
Total copper losses $= I_a^2 R_a + I_{sh}^2 R_{sh}$
$= 50^2 \times (0.01) + (5)^2 \times 44$
$= 1125$ Watt
$\eta = \frac{O/p}{O/p + \text{losses}} = \frac{220 \times 45}{220 \times 45 + (1125) + 375}$
$= 0.86842$ ro 86.84%

Q NO. 48

A three-phase, 50 Hz salient-pole synchronous motor has a per-phase direct-axis reactance (X_d) of 0.8 pu and a per-phase quadrature-axis reactance (X_q) of 0.6 pu. Resistance of the machine is negligible. It is drawing full-load current at 0.8 pf (leading). When the terminal voltage is 1 pu, per-phase induced voltage, in pu, is _____.

[Ans. *] Range: 1.58 to 1.62

Synchronous motor at leading p.f.

$X_d = 0.8, \phi = 36.86$

$X_q = 0.6, R_q = 0$

$$\tan\psi = \frac{V\sin\phi + I_a.X_a}{V\cos\phi}$$

$\psi = 56.30$

For synchronous motor at leading p.f.

$\psi = \phi + \delta$

$\Rightarrow \delta = 19.70°$

Now, $e = V\cos\delta + I_d X_d$

$I_d = I_a \sin\phi = 0.831$

$$E = (1)\cos(19.7) + (0.831)(0.8) = 1.606$$

Q NO. 49

A single-phase, 22 kVA, 2200 V/ 220 V, 50 Hz, distribution transformer is to be connected as an auto-transformer to get an output voltage of 2420 V. Its maximum kVA rating as an auto-transformer is

(A) 22 (B) 24.2 (C) 242 (D) 2420

[Ans. C]

22 KVA, 2200 V/220 V, 50 Hz

Distribution transformer is to be connected as on auto transformer to get an output voltage of 2420 V

$(kVA)_{maximum}$ as an auto transformer = ?

As voltage rating = is 2420 i.e. (2200 + 220) V

Additive polarity,

$(kVA)_{auto} = (a_{2winding} + 1) \times kVA_{2winding}$

Where, $a_{2winding} = \frac{220}{220} = 10$

$$(kVA)auto = (10 + 1) \times 22 = 242$$

Q NO. 50

A single-phase full-bridge voltage source inverter (VSI) is fed from a 300 V battery. A pulse of 120° duration is used to trigger the appropriate devices in each half-cycle. The rms value of the fundamental component of the output voltage, in volts, is

(A) 234 (B) 245 (C) 300 (D) 331

[Ans. A]

$V_{01\,(rms)} = \frac{2\sqrt{2}}{\pi} V_s \sin d$

Pulse width where $2d = 120°$

$d = 60°$

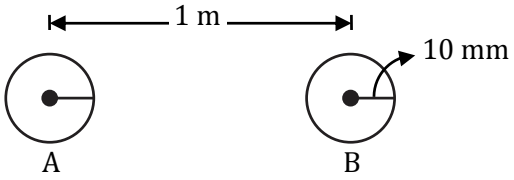
$$V_{01\,(rms)} = \frac{2\sqrt{2}}{\pi} V_s \sin 60° = \frac{2\sqrt{2}}{\pi} V_s \frac{\sqrt{3}}{2} = 234\ V$$

Q NO. 51

A single-phase transmission line has two conductors each of 10 mm radius. These are fixed at a center-to-center distance of 1 m in a horizontal plane. This is now converted to a three-phase transmission line by introducing a third conductor of the same radius. This conductor is fixed at an equal distance D from the two single-phase conductors. The three-phase line is fully transposed. The positive sequence inductance per phase of the three-phase system is to be 5% more than that of the inductance per conductor of the single-phase system. The distance D, in meters, is _____.

[Ans. *] Range: 1.42 to 1.45

In first case

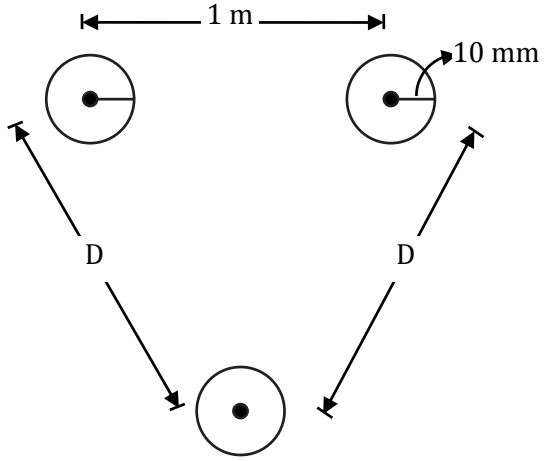


$L_1 = 2 \times 10^{-7} \ln \frac{D}{r} = 2 \times 10^{-7} \ln \left(\frac{100}{0.7788}\right)$

$L_1 = 0.97\ \mu H/m$

$L_2 = 1.05 \times 0.97 = 1.0185\ \mu H/m$

$L_2 = 2 \times 10^{-7} \ln \left(\frac{\sqrt[3]{D^2 \times 100}}{0.7788}\right)$



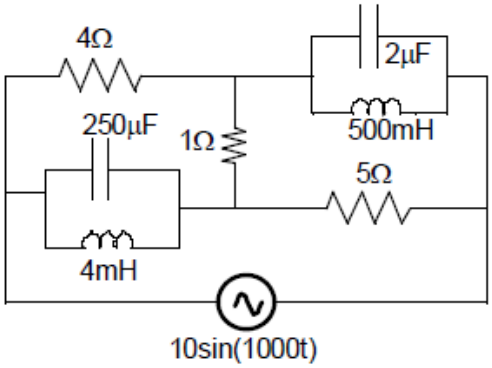
$$\ln \left(\frac{\sqrt[3]{D^2 \times 100}}{0.7788}\right) = \frac{1.0185 \times 10^{-6}}{2 \times 10^{-7}} = 5.0925$$

$e^{5.0925} = \frac{\sqrt[3]{100\ D^2}}{0.7788}$

$D = 142.7\ cm = 1.427\ m$

Q NO. 52

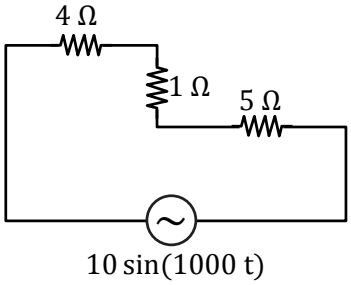
In the circuit shown below, the supply voltage is $10\sin(1000t)$ volts. The peak value of the steady state current through the 1 Ω resistor, in amperes, is _____.



[Ans. *] Range: 1 to 1

If we observe the parallel LC combination we get that at $\omega = 1000$ rad/sec the parallel LC is at resonance thus it is open circuited.

The circuit given in question can be redrawn as



So, $I = \frac{100\sin 1000t}{10} = \sin 100t$;So, peak value is 1 Amp

Q NO. 53

A dc voltage with ripple is given by $v(t) = [100 + 10\sin(\omega t) - 5\sin(3\omega t)]$ volts. Measurements of this voltage $v(t)$, made by moving-coil and moving-iron voltmeters, show readings of V_1 and V_2 respectively. The value of $V_2 - V_1$, in volts, is _____.

[Ans. *] Range: 0.30 to 0.33

Moving coil,

$V(t) = 100 + 10\sin(\omega t) - 5\sin(3\omega t)$ volt

$V_1 = V_{avg} = 100$ V

Moving iron,

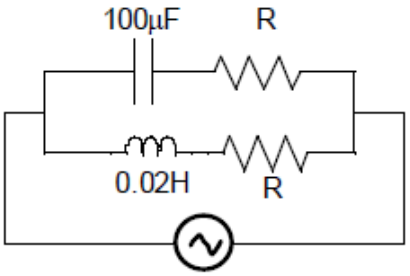
$V_2 = V_{rms} = \sqrt{100^2 + \frac{1}{2}(10^2 + 5^2)}$

$= 100.312$

$V_2 - V_1 = 0.312$

Q NO. 54

The circuit below is excited by a sinusoidal source. The value of R, in Ω, for which the admittance of the circuit becomes a pure conductance at all frequencies is _____.



[Ans. *] Range: 14.0 to 14.2

The resonant frequency for the circuit is

$$\omega_0 = \frac{1}{\sqrt{LC}}\sqrt{\frac{R_L^2 - L/C}{R_C^2 - L/C}}$$

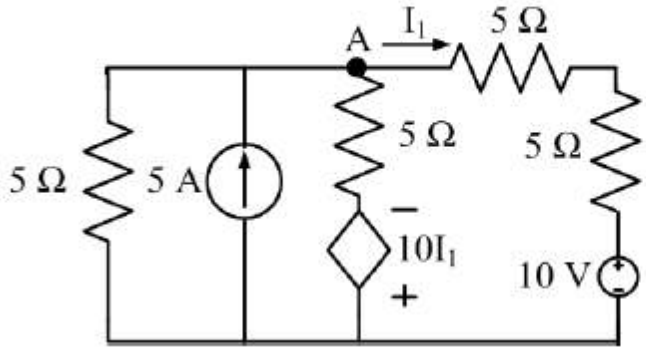
Since, $(R_L = R_C = R)$

So, the circuit will have zero real part of admittance when, $R = \sqrt{\frac{L}{C}}$

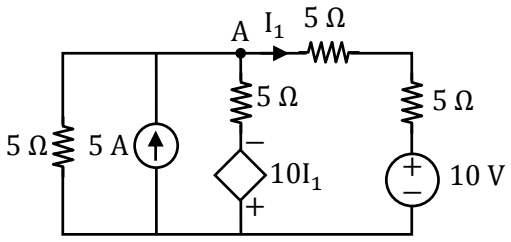
$$\text{So, } R = \sqrt{\frac{0.02}{100\ \mu F}} = 14.14\ \Omega$$

Q NO. 55

In the circuit shown below, the node voltage V_A is _____ V.



[Ans. *] Range: 11.25 to 11.50



Applying KCL at node A, we get

$$\frac{V_A}{5} + \frac{V_A - 10}{10} + \frac{V_A + 10\,I_1}{5} = 5$$

So, $2V_A + V_A - 10 + 2V_A + 20\,I_1 = 5$

$5V_A + 20\,I_1 = 60$

Since, $I_1 = \frac{V_A - 10}{10}$

So, $5V_A + 2V_A - 20 = 60$

$7V_A = 80$

$V_A = \frac{80}{7} = 11.42$

GATE 2016 Examination
Electrical Engineering

Test Date: 07/02/2016
Test Time: 9:00 AM to 12:00 PM
Subject Name: ELECTRICAL ENGINEERING

Section: General Aptitude

Q NO. 1.

The chairman requested the aggrieved shareholders to _____ him.

(A) bare with (B) bore with (C) bear with (D) bare

[Ans. C]

Q NO. 2.

Identify the correct spelling out of the given options:

(A) Managable (B) Manageable (C) Mangaeble (D) Managible

[Ans. B]

Q NO. 3.

Pick the odd one out in the following:

13, 23, 33, 43, 53

(A) 23 (B) 33 (C) 43 (D) 53

[Ans. B]
13, 23, 43, 53 are all prime numbers; Only 33 is composite 33, (11 × 3); Odd one out is 33.

Q NO. 4.

R2D2 is a robot. R2D2 can repair aeroplanes. No other robot can repair aeroplanes.

Which of the following can be logically inferred from the above statements?

(A) R2D2 is a robot which can only repair aeroplanes.

(B) R2D2 is the only robot which can repair aeroplanes.

(C) R2D2 is a robot which can repair only aeroplanes.

(D) Only R2D2 is a robot.

[Ans. B]

Q NO. 5.

If $|9y-6| = 3$, then $y^2 - 4y/3$ is _____.

(A) 0 (B) +1/3 (C) −1/3 (D) undefined

[Ans. C]

$|9y - 6| = 3$

$\Rightarrow$ Either $(9y - 6 = 3)$or $(9y - 6 = -3); \Rightarrow [y = 1]$or $\left[y = \frac{1}{3}\right]$

$\left[y^2 - \frac{4y}{3}\right]$

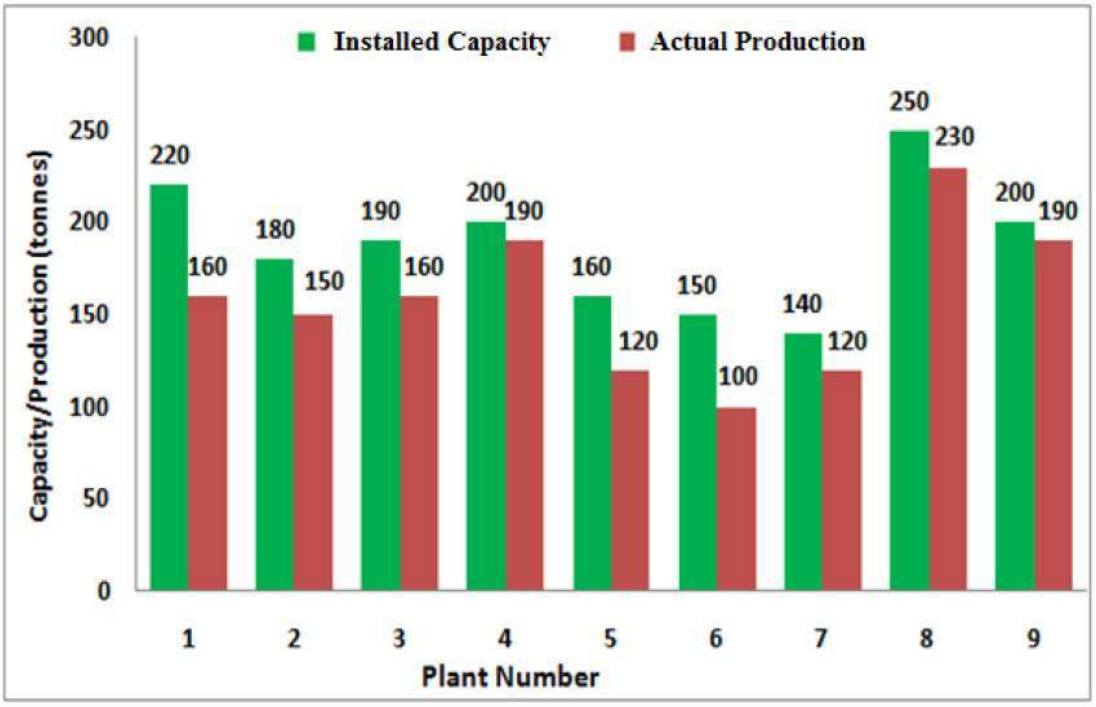
Put $y = \frac{1}{3}; \left(\frac{1}{3}\right)^2 - \frac{4}{3} \times \frac{1}{3} = -\frac{1}{3}$

or $y^2 - \frac{4y}{3}$

Put $y = 1, 1^2 - \frac{4}{3} = -\frac{1}{3}$

Q NO. 6.

The following graph represents the installed capacity for cement production (in tonnes) and the actual production (in tonnes) of nine cement plants of a cement company. Capacity utilization of a plant is defined as ratio of actual production of cement to installed capacity. A plant with installed capacity of at least 200 tonnes is called a large plant and a plant with lesser capacity is called a small plant. The difference between total production of large plants and small plants, in tonnes is ____.



[Ans. *]Range: 120 to 120

According to information in question
Large plants are 1, 4, 8, 9 which are having installed capacity of at least 200 tonnes.
Total production of large plant $[160 + 190 + 230 + 190] = 770$
Remaining plant number 2, 3, 5, 6, 7 all are small plants with capacity less than 200 tonnes.
Total production of small plants $= 150 + 160 + 120 + 100 + 120 = 650$
Difference $= 750 - 650 = z120$

Q NO. 7.

A poll of students appearing for masters in engineering indicated that 60 % of the students believed that mechanical engineering is a profession unsuitable for women. A research study on women with masters or higher degrees in mechanical engineering found that 99 % of such women were successful in their professions.

Which of the following can be logically inferred from the above paragraph?

(A) Many students have misconceptions regarding various engineering disciplines.

(B) Men with advanced degrees in mechanical engineering believe women are well suited to be mechanical engineers.

(C) Mechanical engineering is a profession well suited for women with masters or higher degrees in mechanical engineering.

(D) The number of women pursuing higher degrees in mechanical engineering is small.

[Ans. C]

Q NO. 8.

Sourya committee had proposed the establishment of Sourya Institutes of Technology (SITs) in line with Indian Institutes of Technology (IITs) to cater to the technological and industrial needs of a developing country.

Which of the following can be logically inferred from the above sentence?

Based on the proposal,
(i) In the initial years, SIT students will get degrees from IIT.
(ii) SITs will have a distinct national objective.
(iii) SIT like institutions can only be established in consultation with IIT.
(iv) SITs will serve technological needs of a developing country.

(A) (iii) and (iv) only.
(B) (i) and (iv) only.
(C) (ii) and (iv) only.
(D) (ii) and (iii) only.

[Ans. C]

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Q NO. 9.

Shaquille O' Neal is a 60% career free throw shooter, meaning that he successfully makes 60 free throws out of 100 attempts on average. What is the probability that he will successfully make exactly 6 free throws in 10 attempts?

(A) 0.2508 (B) 0.2816 (C) 0.2934 (D) 0.6000

[Ans. A]

Probability of free throw $= \frac{60}{100} = 0.6$

Probability of NOT free throw $= 1 - 0.6 = 0.4$

So required probability of exactly 6 throws in 10 attempts will be given by

${}^{10}C_6(0.6)^6 \times (0.4)^4 = 0.2508$

Q NO. 10.

The numeral in the units position of $211^{870} + 146^{127} \times 3^{424}$ is _____.

[Ans. *] Range: 7 to 7

Unit digit of $211^{870} + 146^{127} \times 3^{424}$ is $1 + 6 \times 1 = 7$

Section: Technical

Q NO. 1.

The output expression for the Karnaugh map shown below is

A \ BC	00	01	11	10
0	1	0	0	1
1	1	1	1	1

(A) $A + \bar{B}$ (B) $A + \bar{C}$ (C) $\bar{A} + \bar{C}$ (D) $\bar{A} + C$

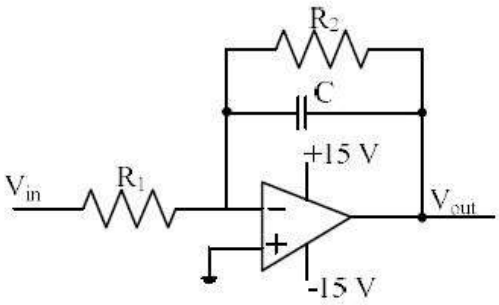
[Ans. B]

A \ BC	00	01	11	10
0	1	0	0	1
1	1	1	1	1

$F = A + \bar{C}$

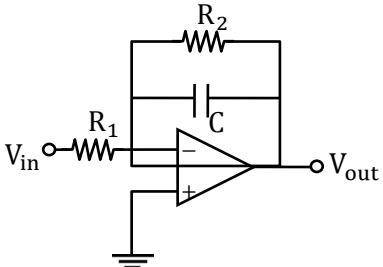
Q NO. 2.

The circuit shown below is an example of a



(A) low pass filter.
(B) band pass filter.
(C) high pass filter.
(D) notch filter.

[Ans. A]



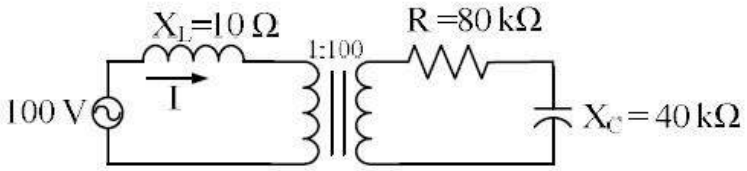
$$\frac{V_{out}}{V_{in}} = \left[\frac{R_2 \cdot \frac{1}{j\omega c} / R_2 + 1/j\omega c}{R_1}\right]$$

$\frac{V_{out}}{V_{in}} = -\left[\frac{R_2}{R_1(R_2 j\omega C + 1)}\right]$

So the system is a low pass filter

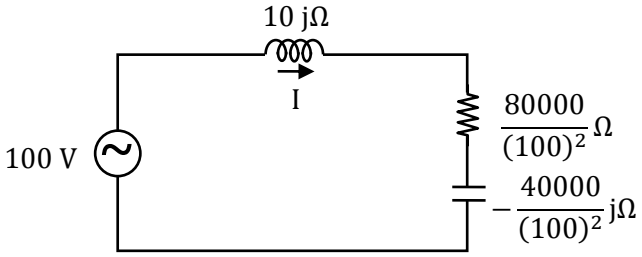
Q NO. 3.

The following figure shows the connection of an ideal transformer with primary to secondary turns ratio of 1:100. The applied primary voltage is 100 V (rms), 50 Hz, AC. The rms value of the current *I*, in ampere, is _____.



[Ans. *] Range: 9.5 to 10.5

The below circuit can be drawn by transferring secondary circuit to primary side.



$I = \frac{100V}{(8 + 10j - 4)\Omega}$

$= \frac{100V}{(8 + 6j)\Omega}$

So the rms value of I will be 10 A.

Q NO. 4.

Consider a causal LTI system characterized by differential equation $\frac{dy(t)}{dt} + \frac{1}{6}y(t) = 3x(t)$. The response of the system to the input $x(t) = 3e^{-\frac{t}{3}}u(t)$, where $u(t)$ denotes the unit step function, is

(A) $9e^{-\frac{t}{3}}u(t)$.

(B) $9e^{-\frac{t}{6}}u(t)$.

(C) $9e^{-\frac{t}{3}}u(t) - 6e^{-\frac{t}{6}}u(t)$.

(D) $54e^{-\frac{t}{6}}u(t) - 54e^{-\frac{t}{3}}u(t)$.

[Ans. D]

The differential equation

$\frac{dy(t)}{dt} + \frac{1}{6}y(t) = 3x(t)$

So, $sY(s) + \frac{1}{6}Y(s) = 3X(s)$

$Y(s) = \frac{3X(s)}{\left(s+\frac{1}{6}\right)}; x(s) = \frac{9}{\left(s+\frac{1}{3}\right)}$

So, $Y(s) = \frac{9}{\left(s+\frac{1}{3}\right)\left(s+\frac{1}{6}\right)} = \frac{54}{\left(s+\frac{1}{6}\right)} - \frac{54}{\left(s+\frac{1}{3}\right)}$

So, $y(t) = \left(54e^{-\frac{1}{6}t} - 54e^{-\frac{1}{3}t}\right)u(t)$

Q NO. 5.

Suppose the maximum frequency in a band-limited signal $x(t)$ is 5 kHz. Then, the maximum frequency in $x(t)\cos(2000\pi t)$, in kHz, is _____.

[Ans. *] Range: 6 to 6

Since x(t) is band limited to 5 kHz then maximum frequency in x(t) cos (20007πt) is 6 kHz.

Q NO. 6.

Consider the function $f(z) = z + z^*$ where z is a complex variable and z^* denotes its complex conjugate. Which one of the following is TRUE?

(A) $f(z)$ is both continuous and analytic
(B) $f(z)$ is continuous but not analytic
(C) $f(z)$ is not continuous but is analytic
(D) $f(z)$ is neither continuous nor analytic

[Ans. B]

$f(z) = z + z^*$
$f(z) = 2x$ is continuous (polynomial)
$u = 2x \quad v = 0$
$u_x = 2 \quad u_y = 0$
$v_x = 0 \quad u_y = 0$
C.R. equation not satisfied.
∴ Nowhere analytic.

Q NO. 7.

A 3×3 matrix P is such that, $P^3 = P$. Then the eigenvalues of P are

(A) $1, 1, -1$
(B) $1, 0.5 + j0.866, 0.5 - j0.866$
(C) $1, -0.5 + j0.866, -0.5 - j0.866$
(D) $0, 1, -1$

[Ans. D]

By Cayley Hamilton theorem
$\lambda^3 = \lambda$
$\lambda = 0, 1, -1$

Q NO. 8.

The solution of the differential equation, for $t > 0$, $y''(t) + 2y'(t) + y(t) = 0$ with initial conditions $y(0) = 0$ and $y'(0) = 1$, is ($u(t)$ denotes the unit step function).

(A) $te^{-t}u(t)$ (B) $(e^{-t} - te^{-t})u(t)$
(C) $(-e^{-t} + te^{-t})u(t)$ (D) $e^{-t}\,u(t)$

[Ans. A]

The differential equation is

$y^{*}(t) + 2y'(t) + y(t) = 0$

So, $\left(s^2Y(s) - sy(0) - v'(0)\right) + 2\,[sY(s) - y(0)] + Y(s) = 0$

So, $Y(s) = \dfrac{sy(0) + y'(0) + 2y(0)}{(s^2 + 2s + 1)}$

Given that $y'(0) = 1, y(0) = 0$

So, $Y(s) = \dfrac{1}{(s+1)^2}$

So, $y(t) = te^{-t}u(t)$

Q NO. 9.

The value of the line integral

$$\int_C (2xy^2dx + 2x^2y\,dy + dz)$$

along a path joining the origin (0, 0, 0) and the point (1, 1, 1) is

(A) 0 (B) 2 (C) 4 (D) 6

[Ans. B]

$\int_C \bar{F} \cdot \bar{dr}$

Where $\bar{F} = xy^2\bar{\imath} + 2x^2\,y\bar{\jmath} + \bar{k}$

$\nabla \times F = 0$

(F is irrotational ⇒ F is conservative)

$F = \nabla\phi$ (ϕ is scalar potational function)

$\phi_x = 2xy^2$

$\phi_y = 2x^2y$

$\phi_z = 1$

$\Rightarrow \phi = x^2y^2 + z + C$

Where, F is conservative

$\int_c \bar{F} \cdot \bar{dr} = \int_{(0,0,0)}^{(1,1,1)} d\phi = [x^2y^2 + z]_{(0,0,0)}^{(1,1,1)} = 2$

Q NO. 10.

Let *f(x)* be a real, periodic function satisfying $f(-x) = -f(x)$. The general form of its Fourier series representation would be

(A) $f(x) = a_0 + \sum_{k=1}^{\infty} a_k \cos(kx)$

(B) $f(x) = \sum_{k=1}^{\infty} b_k \sin(kx)$

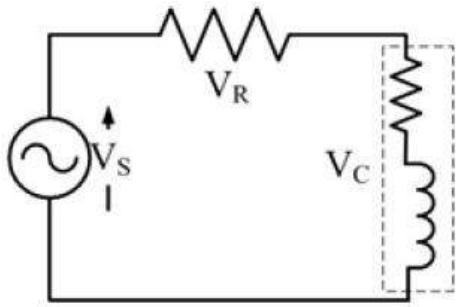
(C) $f(x) = a_0 + \sum_{k=1}^{\infty} a_{2k} \cos(kx)$

(D) $f(x) = \sum_{k=0}^{\infty} a_{2k+1} \sin(2k+1)x$

[Ans. B]

Q NO. 11.

A resistance and a coil are connected in series and supplied from a single phase, 100 V, 50 Hz ac source as shown in the figure below. The rms values of plausible voltages across the resistance (V_R) and coil (V_C) respectively, in volts, are



(A) 65, 35
(B) 50, 50
(C) 60, 90
(D) 60, 80

[Ans. C]

Q NO. 12.

The voltage (V) and current (A) across a load are as follows.
$v(t) = 100 \sin(\omega t)$,
$i(t) = 10 \sin(\omega t - 60°) + 2 \sin(3\omega t) + 5 \sin(5\omega t)$.
The average power consumed by the load, in W, is_____.

[Ans. *] Range: 249 to 251

Method 1:

The average power consumed by the load $P = V_I I_1 \cos\phi_1$

Method 2:

$V(t) = 100 \sin(\omega t)$

$i(t) = 10 \sin(\omega t - 60°) + 2 \sin(3\omega t) + 5 \sin(5\omega t)$

$P = V(t)i(t)$

$= 1000 \sin\omega t \cdot \sin(\omega t - 60°) + 200 \sin\omega t \cdot \sin 3\omega t + 500 \sin\omega t \sin 5\omega t$

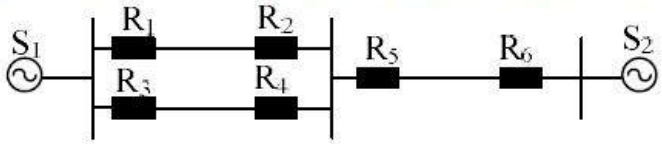
$= 500 [\cos(\omega t - \omega t + 60°) - \cos(\omega t + \omega t - 60°] + 100[\cos(\omega t - 3\omega t) - \cos(\omega t + 3\omega t)]$
$+ 250 [\cos(\omega t - 4\omega t) - \cos(6\omega t)]$

$= 500 \cos 60° = 250$ W

Average value of $\cos(2\omega t - 60°)$, $\cos(2\omega t)$, $\cos(4\omega t)$, $\cos(6\omega t)$ will be zero.

Q NO. 13.

A power system with two generators is shown in the figure below. The system (generators, buses and transmission lines) is protected by six overcurrent relays R_1 to R_6. Assuming a mix of directional and nondirectional relays at appropriate locations, the remote backup relays for R_4 are



(A) R_1, R_2 (B) R_2, R_6 (C) R_2, R_5 (D) R_1, R_6

[Ans. D]

Q NO. 14.

A power system has 100 buses including 10 generator buses. For the load flow analysis using Newton-Raphson method in polar coordinates, the size of the Jacobian is

(A) 189 x 189 (B) 100 x 100 (C) 90 x 90 (D) 180 x 180

[Ans. A]

Size of the Jacobian matrix is, $2m - m - 1 \times 2n - m - 1$

Given that 10 generator buses, we need to assume with in the 10 buses one bus as slack bus then $(2 \times 100 - 10 - 1) \times (2 \times 100 - 10 - 1)$

189×189

Q NO. 15.

The inductance and capacitance of a 400 kV, three-phase, 50 Hz lossless transmission line are 1.6 mH/km/phase and 10 nF/km/phase respectively. The sending end voltage is maintained at 400 kV. To maintain a voltage of 400 kV at the receiving end, when the line is delivering 300 MW load, the shunt compensation required is

(A) capacitive
(B) inductive
(C) resistive
(D) zero

[Ans. B]

$$Z_n = \sqrt{\frac{L}{C}} = \sqrt{\frac{1.6 \times 10^{-3}}{10 \times 10^{-9}}} = 400\Omega$$

$$SIL = \frac{400 \times 400}{400} = 400 \text{ MW}$$

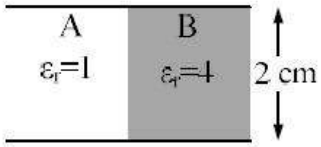
In the second case SIL decreases means Z_n increases.

Z_n increases with increase in inductance 'L'

So, it is inductive; Load $<$ SIL means, line behaves capacitive to compensate it inductor to be placed.

Q NO. 16.

A parallel plate capacitor filled with two dielectrics is shown in the figure below. If the electric field in the region A is 4 kV/cm, the electric field in the region B, in kV/cm, is



(A) 1 (B) 2 (C) 4 (D) 16

[Ans. C]

Q NO. 17.

A 50 MVA, 10 kV, 50 Hz, star-connected, unloaded three-phase alternator has a synchronous reactance of 1 p.u. and a sub-transient reactance of 0.2 p.u. If a 3-phase short circuit occurs close to the generator terminals, the ratio of initial and final values of the sinusoidal component of the short circuit current is _____.

[Ans. *] Range: 4.9 to 5.1

$I'' = \frac{E_g}{X''_d}; I = \frac{E_g}{X}$; $\frac{I''}{I} = \frac{X}{X''_d} = \frac{1.0}{0.2} = 5.0$ p. u

Q NO. 18.

Consider a linear time-invariant system with transfer function

$$H(s) = \frac{1}{(s+1)}$$

If the input is $\cos(t)$ and the steady state output is $A\cos(t+\alpha)$, then the value of A is _____.

[Ans. *] Range: 0.69 to 0.72

$H(s) = \frac{1}{(s+1)}$

Put $s = j\omega$, $H(j\omega) = \frac{1}{j\omega+1}$

$|H(j\omega)| = \frac{1}{\sqrt{\omega^2+1}}$

$\therefore$ Input $x(t) = \cos(t)$

Here $\omega = 1$ rad/sec

and $|x(t)| = 1$; Hence, steady state output

$y(t) = |x(t)| \times |H(j\omega)|_{\omega=1} \cos[t + \angle H(j\omega)]$

$A = [|x(t)| \times |H(j\omega)|]_{\omega=1}$

$A = \frac{1}{\sqrt{2}} = 0.707$

Q NO. 19.

A three-phase diode bridge rectifier is feeding a constant DC current of 100 A to a highly inductive load. If three-phase, 415 V, 50 Hz AC source is supplying to this bridge rectifier then the rms value of the current in each diode, in ampere, is _____.

[Ans. *] Range: 57 to 58

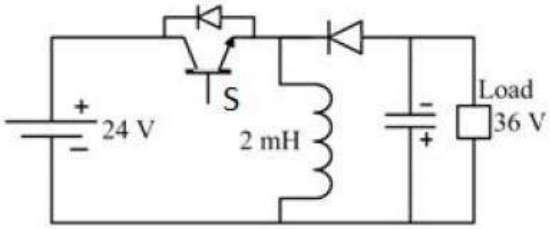
In the 3-ϕ diode bridge rectifier each diode conducts for 120° for one complete cycle

$$I_{D\,rms} = \sqrt{\frac{1}{2\pi}\int_0^{2\pi/3} I_0^2\, d\omega t} = \sqrt{\frac{2\pi}{2\pi \times 3}}$$

$$= \frac{I_o}{\sqrt{3}} = \frac{100}{\sqrt{3}} = 57.7 \text{ A}$$

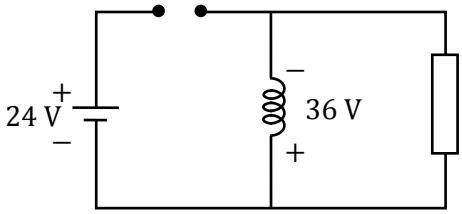
Q NO. 20.

A buck-boost DC-DC converter, shown in the figure below, is used to convert 24 V battery voltage to 36 V DC voltage to feed a load of 72 W. It is operated at 20 kHz with an inductor of 2 mH and output capacitor of 1000 μF. All devices are considered to be ideal. The peak voltage across the solid-state switch (S), in volt, is _____.



[Ans. *] Range: 59.5 to 60.5

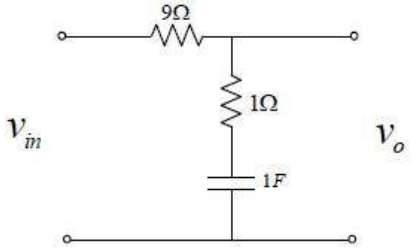
When switch 'S' is OFF, diode D is ON then



∴ Peak voltage across switch = 24 + 36 = 60 V

Q NO. 21.

For the network shown in the figure below, the frequency (in rad/s) at which the maximum phase lag occurs is, _____.



[Ans. *] Range: 0.30 to 0.33

$\because$ Assuming $R_1 = 9\ \Omega; R_2 = 1\ \Omega$

We can write

$$\frac{V_o(s)}{V_{in}(s)} = \frac{R_2 + \frac{1}{sC}}{R_1 + R_2 + \frac{1}{sC}}$$

$$= \frac{1 + R_2 \cdot Cs}{1 + (R_1 + R_2)Cs}$$

$$= \frac{1 + R_2 \cdot Cs}{1 + \left(\frac{R_1 + R_2}{R_2}\right) R_2 Cs}$$

Let $R_2C = T$

$$\frac{R_1 + R_2}{R_2} = \beta$$

Hence $\frac{V_o(s)}{V_{in}(s)} = \frac{1 + Ts}{(1 + \beta Ts)}$

Which represent a lag compensator

$\therefore$ Here $T = R_2C = 1.1 = 1$ sec

$$\beta = \frac{1 + 9}{1} = 10$$

Maximum phase lag occurs at frequency

$$\omega_n = \frac{1}{T\sqrt{\beta}} = \frac{1}{1\sqrt{10}}$$

$= 0.316$ rad/sec

Q NO. 22.

The direction of rotation of a single-phase capacitor run induction motor is reversed by

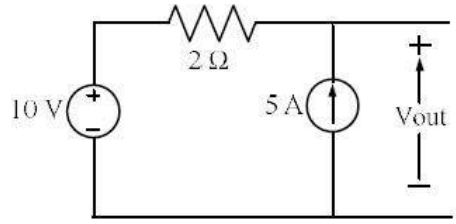
(A) interchanging the terminals of the AC supply.
(B) interchanging the terminals of the capacitor.
(C) interchanging the terminals of the auxiliary winding.
(D) interchanging the terminals of both the windings.

[Ans. C]

Inter changing the terminals of the auxiliary winding

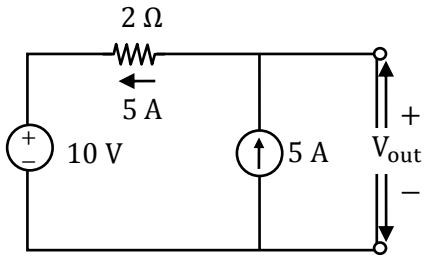
Q NO. 23.

In the circuit shown below, the voltage and current sources are ideal. The voltage (V_{out}) across the current source, in volts, is



(A) 0 (B) 5 (C) 10 (D) 20

[Ans. D]



So $V_{out} = (5 \times 2) + 10$
$= 20$ V

Q NO. 24.

The graph associated with an electrical network has 7 branches and 5 nodes. The number of independent KCL equations and the number of independent KVL equations, respectively, are

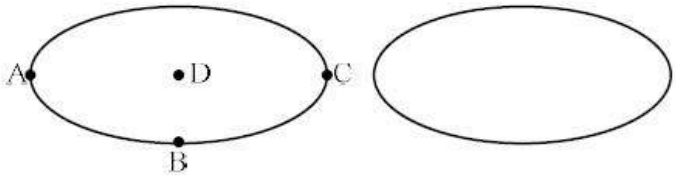
(A) 2 and 5 (B) 5 and 2 (C) 3 and 4 (D) 4 and 3

[Ans. D]

Number of KCL equation $= n - 1 = 5 - 1 = 4$
Number of KVL equation $= b - (n - 1) = 7 - (5 - 1) = 3$

Q NO. 25.

Two electrodes, whose cross-sectional view is shown in the figure below, are at the same potential. The maximum electric field will be at the point



(A) A (B) B (C) C (D) D

[Ans. A]

Q NO. 26.

The Boolean expression $\overline{(a + \bar{b} + c + \bar{d}) + (b + \bar{c})}$ simplifies to

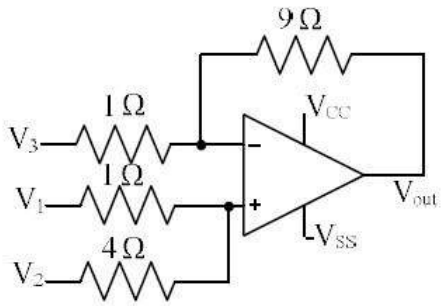
(A) 1 (B) $\overline{a.b}$ (C) $a.b$ (D) 0

[Ans. D]

$F = \overline{(a + \bar{b} + c + \bar{d}) + (b + \bar{c})} = \overline{(a + \bar{b} + c + \bar{d})} \cdot \overline{(b + \bar{c})}$
$= \bar{a} \cdot b \cdot \bar{c} \cdot d \cdot \bar{b} \cdot c$
$= 0$

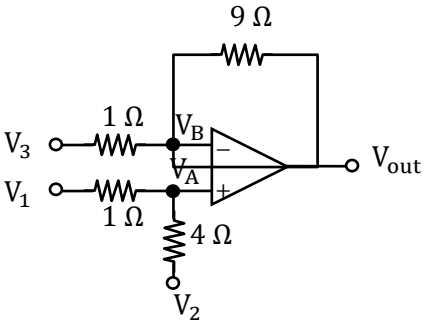
Q NO. 27.

For the circuit shown below, taking the opamp as ideal, the output voltage V_{out} in terms of the input voltages V_1 , V_2 and V_3 is



(A)$1.8V_1 + 7.2V_2 - V_3$ (B) $2V_1 + 8V_2 - 9V_3$ (C) $7.2V_1 + 1.8V_2 - V_3$ (D) $8V_1 + 2V_2 - 9V_3$

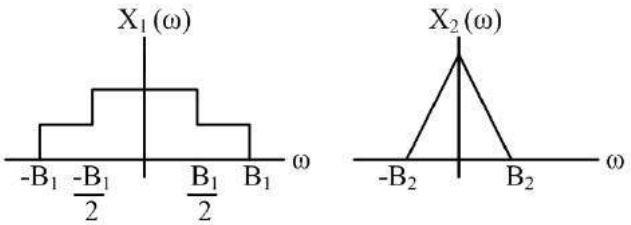
[Ans. D]

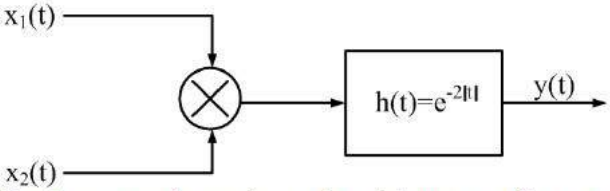


$V_A = \left(\frac{4}{5}V_1 + \frac{1}{5}V_2\right)$; $V_{out} = -9V_3 + 10V_A = -9V_3 + 8V_1 + 2V_2$

Q NO. 28.

Let $x_1(t) \leftrightarrow X_1(\omega)$ and $x_2(t) \leftrightarrow X_2(\omega)$ be two signals whose Fourier Transforms are as shown in the figure below. In the figure, $h(t) = e^{-2|t|}$ denotes the impulse response.





For the system shown above, the minimum sampling rate required to sample y(t), so that y(t) can be uniquely reconstructed from its samples, is

(A) $2B_1$ (B) $2(B_1+B_2)$ (C) $4(B_1+B_2)$ (D) ∞

[Ans. B]
Given that
Bandwidth of $X_1(\omega) = B_1$
Bandwidth of $X_2(\omega) = B_2$
System has $h(t) = e^{-2|t|}$ and input to the system is $x_1(t) \cdot x_2(t)$
The bandwidth of $x_1(t)$is $B_1 + B_2$
The bandwidth of output $B_1 + B_2$
So sampling rate will be $2(B_1 + B_2)$

Q NO. 29.

The value of the integral $2\int_{-\infty}^{\infty}\left(\frac{sin2\pi t}{\pi t}\right)dt$ is equal to

(A) 0 (B) 0.5 (C) 1 (D) 2

[Ans. D]
The Fourier transform of
$\frac{2\sin(t\tau/2)}{t} \rightarrow 2\pi \text{rect}\left(\frac{\omega}{\tau}\right)$
$\frac{\sin(2\pi t)}{\pi t} \rightarrow \text{rect}\left(\frac{\omega}{4\pi}\right)$
So, $\int_{-\infty}^{\infty}\frac{\sin(2\pi t)}{\pi t}e^{-j\omega t}dt = \text{rect}\left(\frac{\omega}{4\pi}\right)$
Putting $\omega = 0$in above equation
$\int_{-\infty}^{\infty}\frac{\sin(2\pi t)}{\pi t}dt = 1$
$2\int_{-\infty}^{\infty}\frac{\sin(2\pi)}{\pi t}dt = 2$

Q NO. 30.

Let $y(x)$ be the solution of the differential equation $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = 0$ with initial conditions $y(0) = 0$ and $\left.\frac{dy}{dx}\right|_{x=0} = 1$. Then the value of $y(1)$ is _____.

[Ans. *] Range: 7.0 to 7.5
A. E $m^2 - 4m + 4 = 0$
$m = 2, 2$
$y = (C_1 + C_2x)e^{2x}$
$y(0) = 0 \Rightarrow C_1 = 0$
$y = C_2xe^{2x}$
$y' = C_2e^{2x} + 2C_2xe^{2x}$
$\Rightarrow C_2 = 1$
$y = xe^{2x}$; $y(1) = e^2 = 7.38$

Q NO. 31.

The line integral of the vector field $F = 5xz\,\hat{\imath} + (3x^2 + 2y)\,\hat{\jmath} + x^2 z\,\hat{k}$ along a path from (0,0,0) to (1,1,1) parametrized by (t, t^2, t) is _____.

[Ans. *] Range: 4.40 to 4.45

$E = 5xz\bar{i} + (3x^2 + 3y)\bar{j} + x^2 z\bar{k}$

$$= \int_c \bar{F} \cdot \bar{dr}$$

$$= \int_c 5xzdx + (3x^2 + 2y)\,dy + x^2 zdz$$

$x = t, y = t^2, z = t, t = 0$ to 1

$dx = dt;\ dy = 2t\ dy, dz = dt$

$$= \int_0^1 5t^2 dt + (3t^2 + 2t^2)2tdt + t^3 dt$$

$$= \int_0^1 (5t^2 + 11t^3)dt$$

$$= \left[\frac{5t^3}{3} + \frac{11t^4}{4}\right]_0^1 = \frac{5}{3} + \frac{11}{4} = \frac{53}{12} = 4.41$$

Q NO. 32.

Let $P = \begin{bmatrix} 3 & 1 \\ 1 & 3 \end{bmatrix}$. Consider the set S of all vectors $\begin{pmatrix} x \\ y \end{pmatrix}$ such that $a^2 + b^2 = 1$ where $\begin{pmatrix} a \\ b \end{pmatrix} = P\begin{pmatrix} x \\ y \end{pmatrix}$. Then S is

(A) a circle of radius $\sqrt{10}$

(B) a circle of radius $\frac{1}{\sqrt{10}}$

(C) an ellipse with major axis along $\begin{pmatrix} 1 \\ 1 \end{pmatrix}$

(D) an ellipse with minor axis along $\begin{pmatrix} 1 \\ 1 \end{pmatrix}$

[Ans. D]

Q NO. 33.

Let the probability density function of a random variable, X, be given as:

$$f_X(x) = \frac{3}{2}e^{-3x}u(x) + ae^{4x}u(-x)$$

where $u(x)$ is the unit step function.

Then the value of 'a' and $Prob\{X \leq 0\}$, respectively, are

(A) $2, \frac{1}{2}$ (B) $4, \frac{1}{2}$ (C) $2, \frac{1}{4}$ (D) $4, \frac{1}{4}$

[Ans. A]

$$f_x(x) = \begin{cases} ae^{4x} & x < 0 \\ \frac{3}{2}e^{-3x} & x \geq 0 \end{cases}$$

$$\int_{-\infty}^{\infty} f_x(x) = 1$$

.

$$\int_{-\infty}^{\infty} ae^{4x}\,dx + \int_{0}^{\infty} \frac{3}{2}e^{-3x}\,dx = 1$$

$$\left[\frac{ae^{4x}}{4}\right]_{-\infty}^{0} + \left[\frac{\frac{3}{2}e^{-3x}}{-3}\right]_{0}^{\infty} = 1$$

$$\frac{a}{4} + \frac{3}{6} = 1$$

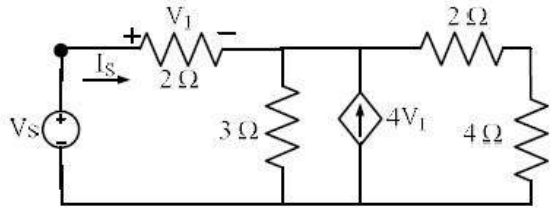
$$a = 2$$

$$P(x < 0) = \int_{-\infty}^{0} 2e^{4x}\,dx$$

$$= \left[\frac{e^{4x}}{2}\right]_{-\infty}^{0} = \frac{1}{2}$$

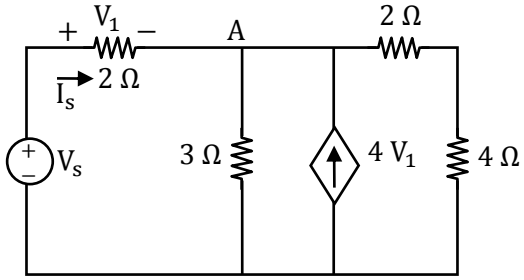
Q NO. 34.

The driving point input impedance seen from the source V_S of the circuit shown below, in Ω, is _____.



[Ans. *] Range: 19.5 to 20.5

To find impedance seen by V_s



$$Z_s = \frac{V_s}{I_s}$$

$$V_1 = 2I_s$$

Applying KCL at node A

$$I_s + 4V_1 = \frac{V_A}{3} + \frac{V_A}{6}$$

$$V_A = V_s - V_1 \text{ and } V_1 = 2I_s$$

$$\text{So, } I_s + 8I_s = \frac{V_s - 2I_s}{3} + \frac{V_s - 2I_s}{6}$$

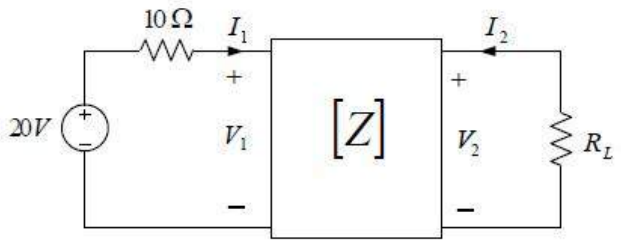
$$\Rightarrow 54\,I_s = 2V_s - 4I_s + V_s - 2I_S$$

$$\Rightarrow 3V_s = 60\,I_s$$

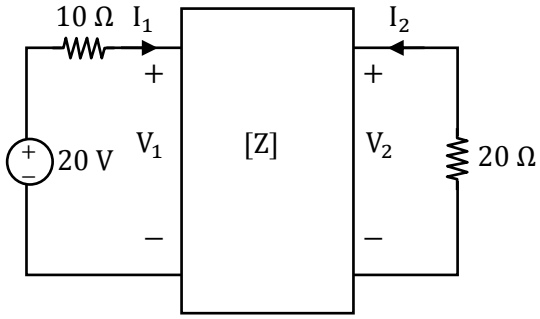
$$\frac{V_s}{I_s} = 20\ \Omega$$

Q NO. 35.

The z-parameters of the two port network shown in the figure are $z_{11} = 40\ \Omega$, $z_{12} = 60\ \Omega$, $z_{21} = 80\ \Omega$ and $z_{22} = 100\ \Omega$. . The average power delivered to $R_L = 20\ \Omega$, in watts, is _____.



[Ans. *] Range: 34 to 36



Given $Z_{11} = 40\Omega$; $Z_{12} = 60$ W

$Z_{21} = 80\ \Omega$; $Z_{22} = 100\Omega$

From the figure $V_2 = -20I_2$ ……①

And $V_1 = 40\ I_1 + 60I_2$ ……②

$V_2 = 80I_1 + 100I_2$ ……③

From equation ① and ③ we get

So, $-20I_2 = 80I_1 + 100I_2$

$\Rightarrow I_2 = -\frac{2}{3}I_1$ ……④

Using equation ② and ④, we get

So, $V_1 = 40\ I_1 + 60I_2 = 40I_1 + 60\left(\frac{-2}{3}\right)I_1$

$V_1 = 0$

From the figure, $20 = 10I_1 + V_1$

Since $V_1 = 0$

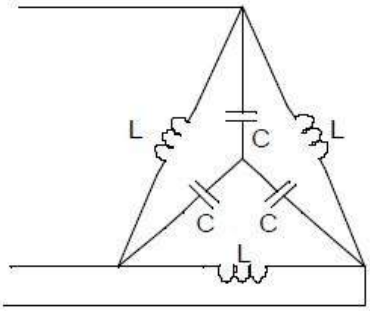
So, $I_1 = 2A$

So, $I_2 = -\frac{4}{3}A$

Power dissipated in $R_L = I_2^2\ R_L = \left(\frac{4}{3}\right)^2 \times 20 = \frac{16}{9} \times 20 = 35.55$ W

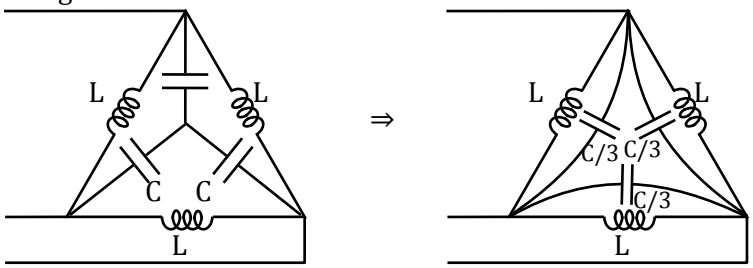
Q NO. 36.

In the balanced 3-phase, 50 Hz, circuit shown below, the value of inductance (L) is 10 mH. The value of the capacitance (C) for which all the line currents are zero, in millifarads, is _____.



[Ans. *] Range: 2.9 to 3.1

Using star to delta conversion



Line current will be zero when the parallel pair of induction-capacitor is resonant at f = 50 Hz

So, $50 \times 2\pi = \frac{1}{\sqrt{LC/3}}$

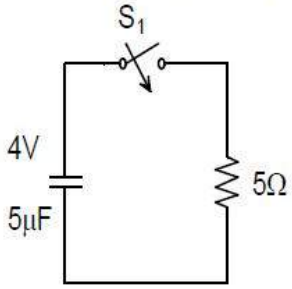
$100\pi = \frac{1}{\sqrt{LC/3}}$

Since, L = 10 mH

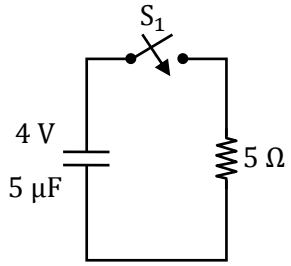
C will be 3.03 mF

Q NO. 37.

In the circuit shown below, the initial capacitor voltage is 4 V. Switch S_1 is closed at $t = 0$. The charge (in μC) lost by the capacitor from $t = 25$ μs to $t = 100$ μs is _____.



[Ans. *] Range: 6.8 to 7.2



$i(t) = \left(\frac{4}{5}e^{-t/\tau}\right)$; $\tau = RC = 25 \times 10^{-6}$ sec

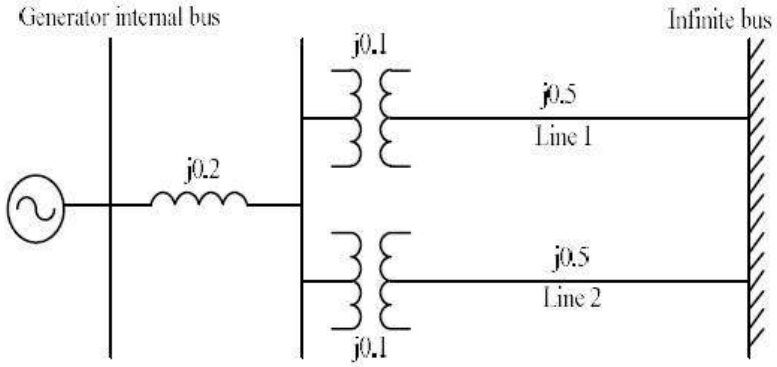
Change lost by capacitor from $t = 25$ μs to 100 μs is

$$\int_{25\ \mu s}^{100\ \mu s} i(t)dt = 6.99 \times 10^{-6}\ C$$

Q NO. 38.

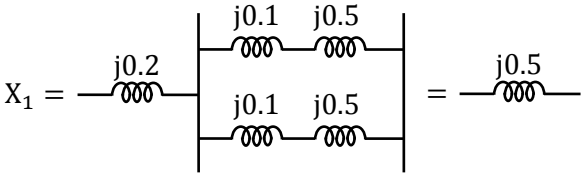
The single line diagram of a balanced power system is shown in the figure. The voltage magnitude at the generator internal bus is constant and 1.0 p.u. The p.u. reactances of different components in the system are also shown in the figure. The infinite bus voltage magnitude is 1.0 p.u. A three phase fault occurs at the middle of line 2.

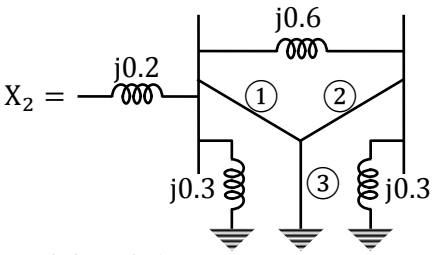
The ratio of the maximum real power that can be transferred during the pre-fault condition to the maximum real power that can be transferred under the faulted condition is _____.



[Ans. *] Range: 2.20 to 2.35

The ratio $= \frac{P_1}{P_2} = \frac{X_2}{X_1}$

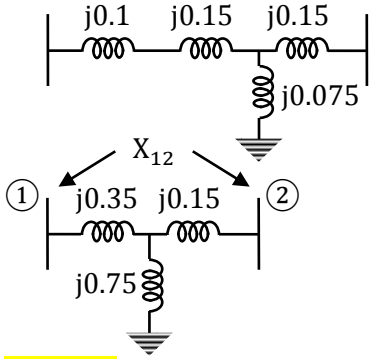




$\Rightarrow \frac{j0.3 \times j0.6}{j1.2} = j0.15 \ldots\ldots\ldots (1)$

$\Rightarrow \frac{j0.3 \times j0.6}{j1.2} = j0.15 \ldots\ldots\ldots (2)$

$\Rightarrow \frac{j0.3 \times j0.3}{j1.2} = j0.075 \ldots\ldots\ldots (3)$



$X_{12} = X_2$

$j0.35 + j0.15 + \frac{j0.35 \times j0.15}{j0.075} = j1.2 \text{ p.u.}$

$\frac{P_1}{P_2} = \frac{X_2}{x_1} = \frac{j1.2}{j0.5} = 2.4$

Q NO. 39.

The open loop transfer function of a unity feedback control system is given by

$$G(s) = \frac{K(s+1)}{s(1+Ts)(1+2s)}, \qquad K > 0, T > 0 .$$

The closed loop system will be stable if,

(A) $0 < T < \frac{4(K+1)}{K-1}$

(B) $0 < K < \frac{4(T+2)}{T-2}$

(C) $0 < K < \frac{T+2}{T-2}$

(D) $0 < T < \frac{8(K+1)}{K-1}$

[Ans. C]

.

Open loop transfer function

$G(s) = \frac{K(s+1)}{s(1+Ts)(1+2s)}$; $K > 0$ and $T > 0$

For closed loop system stability, characteristic equation is

$1 + G(s)H(s) = 0$

$1 + \frac{K(s+1)}{s(1+Ts)(1+2s)}.1 = 0$

$s(1+Ts)(1+2s) + k(s+1) = 0$

$2Ts^3 + (2+T)s^2 + (1+k)s + k = 0$

Using Routh's criteria

s^3	$2T$	$(1+k)$
s^2	$(2+T)$	K
s^1	$\frac{(2+T)(1+k)-2Tk}{(2+T)}$	0
s^0	K	

For stability, $k > 0$

And $(2+T)(1+k) - 2Tk > 0$

$k(2+T-2T) + (2+T) > 0$

Or, $-(T-2)k + 2(2+T) > 0$

$-(T-2)k + 2(2+T) > 0$

$-k > -\frac{(2+T)}{(T-2)}$

$-k > -\frac{(2+T)}{(T-2)}$

Or, $k < \frac{T+2}{(T-2)}$

Hence for stability,

$0 < k < \frac{T+2}{T-2}$

Q NO. 40.

At no load condition, a 3-phase, 50 Hz, lossless power transmission line has sending-end and receiving-end voltages of 400 kV and 420 kV respectively. Assuming the velocity of traveling wave to be the velocity of light, the length of the line, in km, is _____.

[Ans. *] Range: 294.0 to 298.0

At no load, $V_s = AV_R$

$400 = A\,420$

$A = \frac{400}{420} = 0.9524$

$A = 1 + \frac{YZ}{2} = 1 + \frac{(r+j\omega L)(g+j\omega C)}{2}$

For lossless line $r = 0, g = 0$

Then, $A = 1 - \frac{(\omega C)(\omega L)}{2}$

$\beta l = \sqrt{\omega L\, \omega C}$

$A = 0.9524 = 1 - \frac{\beta^2 l^2}{2}$

$\beta l = 0.3085$

$\beta = \frac{0.3085}{l}$

$\frac{V}{f} = \frac{2\pi}{\beta}$

$\frac{30 \times 10^5}{50} = \frac{2\pi}{\left(\frac{0.3085}{l}\right)}$

$l = 294.59$ km

Q NO. 41.

The power consumption of an industry is 500 kVA, at 0.8 p.f. lagging. A synchronous motor is added to raise the power factor of the industry to unity. If the power intake of the motor is 100 kW, the p.f. of the motor is _____

[Ans. *] Range: 0.31 to 0.33

$P_1 = 500 \times 0.8 = 400$ kW

$Q_1 = 500 \times 0.6 = 300$ kVAR

The power factor is to be raised to unity

The motor has to supply 300 kVAR

The motor rating is 100 kW, 300 kVAR

$\phi_m = \tan^{-1}\left(\frac{Q}{P}\right)$

$\phi_m = \tan^{-1}\left(\frac{300}{100}\right) = 71.56$

Power factor of motor $= \cos\phi_m = \cos 71.56 = 0.316$

Q NO. 42.

The flux linkage (λ) and current (i) relation for an electromagnetic system is $\lambda = (\sqrt{i})/g$. When i = 2A and g (air-gap length) = 10 cm, the magnitude of mechanical force on the moving part, in N, is _____.

[Ans. *] Range: 186 to 190

Q NO. 43.

The starting line current of a 415 V, 3-phase, delta connected induction motor is 120 A, when the rated voltage is applied to its stator winding. The starting line current at a reduced voltage of 110 V, in ampere, is _____.

[Ans. *] Range: 31.0 to 33.0

415 V, 3-phase, Δ connected induction motor $(I_{st})_{line} = 120$ A at rated voltage.

At, V = 110 V, i.e. reduced voltage

$I_{st} = x(I_{st})_{rated}$

Where, $x = \frac{V_{reduced}}{V_{rated}}$

$x = \frac{110}{415}$

$(I_{st})_{at\ 110\ V} = \left(\frac{110}{415}\right) \times 120$

$= 31.807$ A

Q NO. 44.

A single-phase, 2 kVA, 100/200 V transformer is reconnected as an auto-transformer such that its kVA rating is maximum. The new rating, in kVA, is _____.

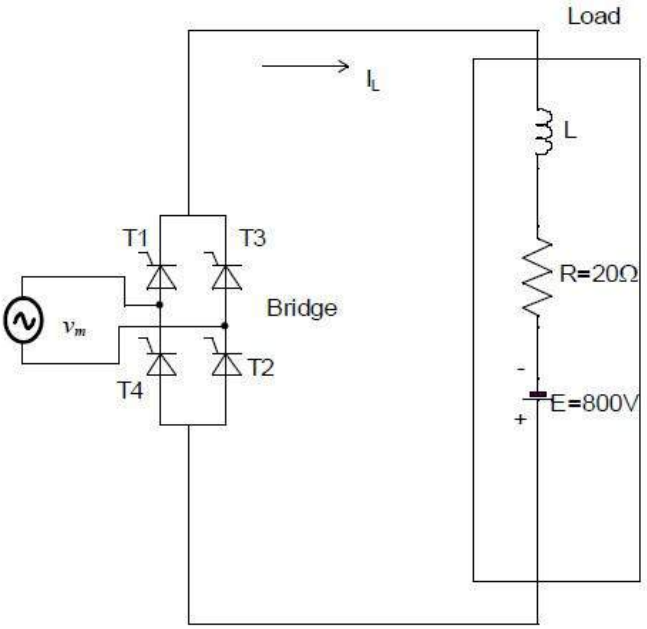
[Ans. *] Range: 5.9 to 6.1

2 kVA, 100/200 V transformer, $a_{2winding} = \frac{200}{100} = 2$

$[(kVA)_{auto}]_{max} = (a_{2winding} + 1)(kVA)_{2winding} = (2 + 1) \times 2 = 6$

Q NO. 45.

A full-bridge converter supplying an RLE load is shown in figure. The firing angle of the bridge converter is 120°. The supply voltage $v_m(t) = 200\pi \sin(100\pi t)$ V, R=20 Ω, E=800 V. The inductor L is large enough to make the output current I_L a smooth dc current. Switches are lossless. The real power fed back to the source, in kW, is _____.



[Ans. *] Range: 5.9 to 6.1

$V_o = 2\frac{V_m}{\pi}\cos\alpha = 2\frac{200\pi}{\pi}\cos 120°$

$V_o = -200$ V

$|V_o| = 200$ V

Power balance equation, $EI_o = I_o^2R + V_oI_o$

$800\ I_o = I_o^2(20) + 200\ I_o$

$I_o = 30$ A

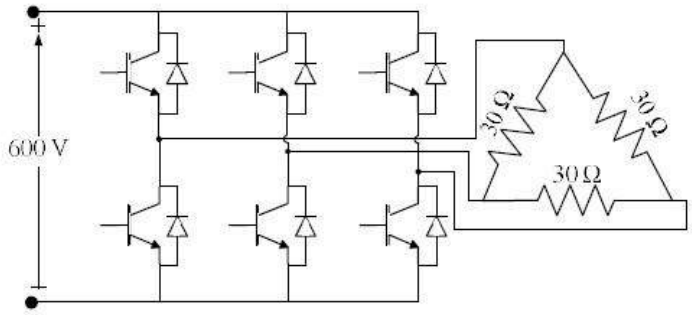
$I_o = I_{or}$

Power fed to source $= V_o\ I_o$

$= 200 \times 30 = 6$ kW

Q NO. 46.

A three-phase Voltage Source Inverter (VSI) as shown in the figure is feeding a delta connected resistive load of 30 Ω/phase. If it is fed from a 600 V battery, with 180° conduction of solid-state devices, the power consumed by the load, in kW, is _____.



[Ans. *] Range: 23 to 25

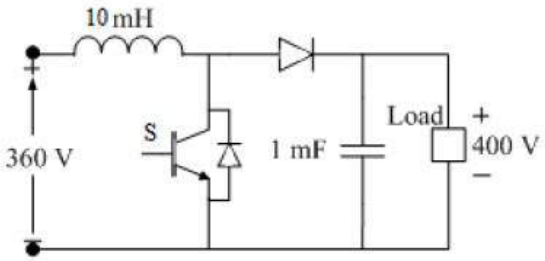
$$V_L = V_{ph} = \sqrt{\frac{2}{3}}V_s$$

$$V_{ph} = \sqrt{\frac{2}{3}} \times 600$$

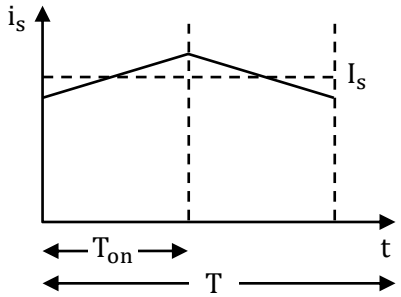
$$P = 3\frac{V_{ph}^2}{R} = \frac{3 \times \frac{2}{3} \times 600^2}{30} = 24 \text{ kW}$$

Q NO. 47.

A DC-DC boost converter, as shown in the figure below, is used to boost 360V to 400 V, at a power of 4 kW. All devices are ideal. Considering continuous inductor current, the rms current in the solid state switch (S), in ampere, is _____.



[Ans. *] Range: 3 to 4



$\frac{V_o}{V_s} = \frac{1}{1-\alpha}$

$\frac{400}{360} = \frac{1}{1-\alpha}$

$\alpha = 0.1$

$V_s\, I_s = \text{Power}$

$360\, I_s = 4000$

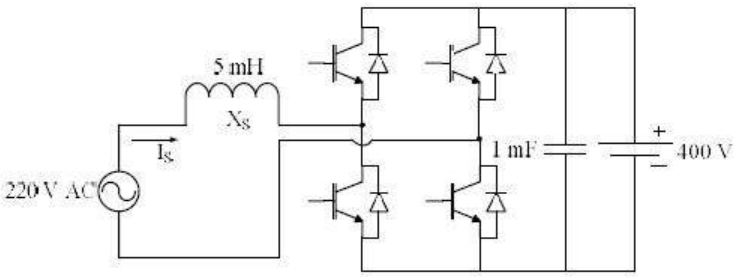
$I_s = 11.1\ \text{A}$

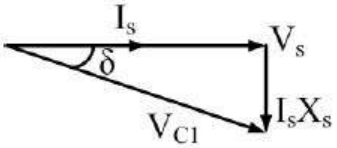
Neglecting ripple in i_s, $I_{\text{switch (rms)}} = I_s \left(\frac{T_{on}}{T}\right)^{1/2}$

$= I_s \sqrt{\alpha} = 11.1\sqrt{0.1} = 3.5\ \text{A}$

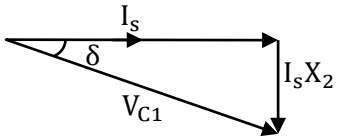
Q NO. 48.

A single-phase bi-directional voltage source converter (VSC) is shown in the figure below. All devices are ideal. It is used to charge a battery at 400 V with power of 5 kW from a source $V_s = 220$ V (rms), 50 Hz sinusoidal AC mains at unity p.f. If its AC side interfacing inductor is 5 mH and the switches are operated at 20 kHz, then the phase shift (δ) between AC mains voltage (V_s) and fundamental AC rms VSC voltage (V_{C1}), in degree, is _____.





[Ans. *] Range: 9.1 to 9.3



$P = V_s I_s$ p.f.

$5 \times 10^3 = 220 \times I_s \times 1$

$I_s = 22.72\ \text{A}$

$\tan\delta = \frac{I_s X_s}{V_s}$

$\delta = \tan^{-1}\left(\frac{22.72 \times 2\pi \times 50 \times 5 \times 10^{-3}}{220}\right)$

$\delta = 9.21°$

Q NO. 49.

Consider a linear time invariant system $\dot{x} = Ax$, with initial condition $x(0)$ at $t = 0$. Suppose α and β are eigenvectors of (2 x 2) matrix A corresponding to distinct eigenvalues λ_1 and λ_2 respectively. Then the response $x(t)$ of the system due to initial condition $x(0) = \alpha$ is

(A) $e^{\lambda_1 t}\alpha$ (B) $e^{\lambda_2 t}\beta$ (C) $e^{\lambda_2 t}\alpha$ (D) $e^{\lambda_1 t}\alpha + e^{\lambda_2 t}\beta$

[Ans. A]

$\dot{x} = Ax$

Eigen values are λ_1 and λ_2

We can write,

$$\phi(t) = \begin{bmatrix} e^{\lambda_1 t} & 0 \\ 0 & e^{\lambda_2 t} \end{bmatrix}$$

Response due to initial conditions,

$x(t) = \phi(t).x(0)$

$$x(t) = \begin{bmatrix} e^{\lambda_1 t} & 0 \\ 0 & e^{\lambda_2 t} \end{bmatrix} \begin{bmatrix} \alpha \\ 0 \end{bmatrix} = \alpha\, e^{\lambda_1 t}$$

Q NO. 50.

A second-order real system has the following properties:
a) the damping ratio $\zeta = 0.5$ and undamped natural frequency ω_n=10 rad/s,
b) the steady state value of the output, to a unit step input, is 1.02.
The transfer function of the system is

(A) $\frac{1.02}{s^2+5s+100}$ (B) $\frac{102}{s^2+10s+100}$

(C) $\frac{100}{s^2+10s+100}$ (D) $\frac{102}{s^2+5s+100}$

[Ans. B]

Damping ratio $\xi = 0.5$

Undamped natural frequency $\omega_n = 10\ \text{rad/sec}$

Steady state output to a unit step input $C_{ss} = 1.02$

Hence, steady state error $= 1.02 - 1.00$

$e_{ss} = 0.02$

$\because$ Characteristics equation is,

$s^2 + 2\xi\omega_n s + \omega_n^2 = 0$

$s^2 + 2 \times 0.5 \times 10\, s + 100 = 0$

$s^2 + 10s + 100 = 0$

From options, if we take option B

Then,

$$C_{ss} = \lim_{s\to 0} s.C(s) = \lim_{s\to 0} s \times \frac{1}{s} \times \frac{102}{s^2 + 10s + 100}$$

$C_{ss} = 1.02$

Hence option B is correct answer

Q NO. 51.

Three single-phase transformers are connected to form a delta-star three-phase transformer of 110 kV/ 11 kV. The transformer supplies at 11 kV a load of 8 MW at 0.8 p.f. lagging to a nearby plant. Neglect the transformer losses. The ratio of phase currents in delta side to star side is

(A) $1 : 10\sqrt{3}$ (B) $10\sqrt{3} : 1$ (C) $1 : 10$ (D) $\sqrt{3} : 10$

[Ans. A]

At 11 kV, load is 8 MW, 0.8 PF lagging

$$\Rightarrow \frac{(V_{ph})_{\Delta}}{(V_{ph})_{Y}} = \frac{(I_{ph})_{Y}}{(I_{ph})_{\Delta}}$$

$$\Rightarrow (I_{ph})_{\Delta} = (I_{ph})_{Y} \times \frac{(V_{ph})_{Y}}{(V_{ph})_{\Delta}}$$

$$\frac{(I_{ph})_{\Delta}}{(V_{ph})_{Y}} = \frac{11/\sqrt{3}}{110} = 1:10\sqrt{3}$$

Q NO. 52.

The gain at the breakaway point of the root locus of a unity feedback system with open loop transfer function $G(s) = \frac{Ks}{(s-1)(s-4)}$ is

(A) 1 (B) 2 (C) 5 (D) 9

[Ans. A]

$$\text{OLTF} \Rightarrow G(s) = \frac{Ks}{(s-1)(s-4)}$$

Now, characteristics equation

$$1 + G(s)H(s) = 0$$

$$\frac{Ks}{(s-1)(s-4)} + 1 = 0$$

$$\Rightarrow Ks + (s^2 - 5s + 4) = 0$$

For break away point: $\frac{dK}{ds} = 0$

$$\frac{dK}{ds} = -\left[1 - 0 - \frac{4}{s^2}\right] = 0$$

We get $s = \pm 2$

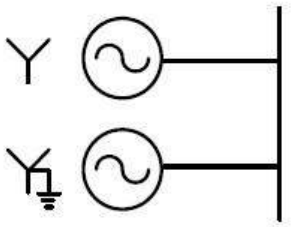
Therefore valid break away point is $s = 2$, now gain at $s = 2$ is

$$\Rightarrow K = \frac{\text{Product of distances from all the poles to break away point}}{\text{Product of distance from all the zeros to break away point}}$$

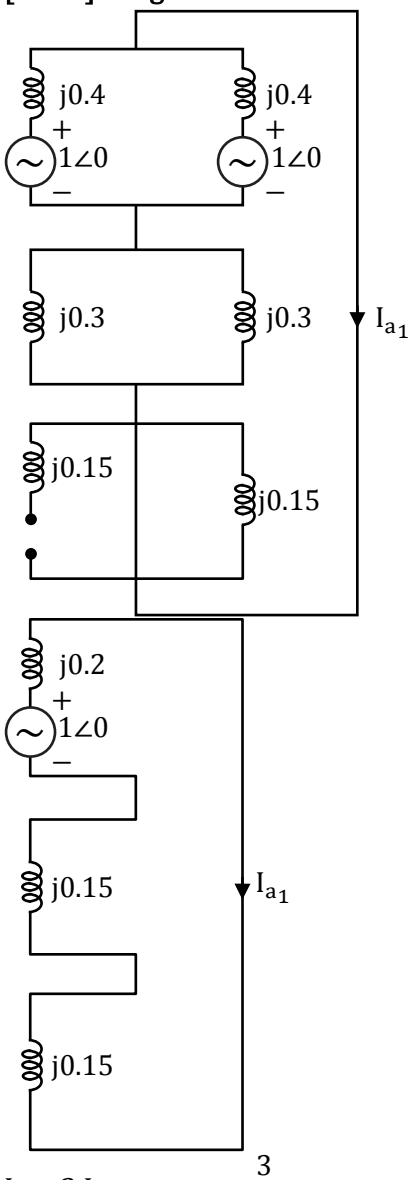
$$\text{Gain, } K = \frac{1 \times 2}{2} = 1$$

Q NO. 53.

Two identical unloaded generators are connected in parallel as shown in the figure. Both the generators are having positive, negative and zero sequence impedances of j0.4 p.u., j0.3 p.u. and j0.15 p.u., respectively. If the pre-fault voltage is 1 p.u., for a line-to-ground (L-G) fault at the terminals of the generators, the fault current, in p.u., is _____.



[Ans. *] Range: 5.5 to 6.5



$$I_f = 3\,I_{a_1} = \frac{3}{0.2 + 0.15 + 0.15}$$

$I_f = 6$ p.u.

Q NO. 54.

An energy meter, having meter constant of 1200 revolutions/kWh, makes 20 revolutions in 30 seconds for a constant load. The load, in kW, is _____.

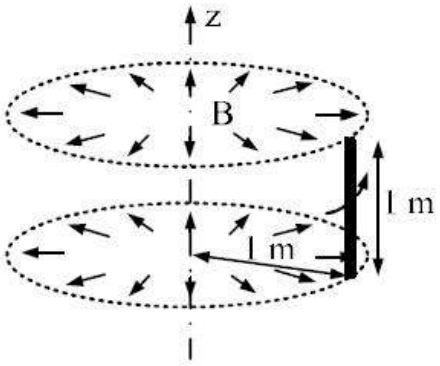
[Ans. *] Range: 1.9 to 2.1

1200 rev/kWh , 20 rev, 30 sec

$$P_{loss} = \frac{20 \times 3600}{1200 \times 30} = 2 \text{ kW}$$

Q NO. 55.

A rotating conductor of 1 m length is placed in a radially outward (about the z-axis) magnetic flux density (B) of 1 Tesla as shown in figure below. Conductor is parallel to and at 1 m distance from the z-axis. The speed of the conductor in r.p.m. required to induce a voltage of 1 V across it, should be _____.



[Ans. *] Range: 9.4 to 9.7

$$\text{Voltage induced} = \int_0^1 E_m . dl$$

(Where E_m is induced electric field)

$= E_m$. volts

Since, voltage induced $= 1$ V

So, $E_m = 1$ V/m

As we know $E_m = \overline{V} \times \overline{B}$

Where V = (Radius of path) × (Angular velocity)

$\frac{1V}{m} = (V \times 1 \text{ Tesla})$

$v = 1$ m/sec

$v = r \times \omega = 1$ m/sec

Since, $r = 1$ m; So, $\omega = 1$ rad/sec

Now from this we get $\omega = 2 \times \pi \times \frac{N}{60} = 1$ rad/sec

$N = \frac{30}{\pi} = 9.55$ revolutions per minute

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.

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.

ANNA UNIVERTISY, CHENNAI -25.

OFFICE OF THE CONTROLLER OF EXAMINATIONS

RULES OF THE EXAMINATIONS

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

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

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

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

11	The candidate possessing cell phone(s)/programmable calculator(s)/any other electronic storage device(s) **gadgets** and containing incriminating materials (whether used or not).	Invalidating the examinations of the subject concerned and all the theory and the practical subjects of the current semester registered by the candidate. Further the candidate is not considered for revaluation of answer scripts of the arrears-subjects. If the candidate has registered for arrears – subjects only, invalidating the examinations of all the arrears – subjects registered by the candidate.
12	The Candidate possessing the question paper of another candidate with additional writing on it.	
13	The candidate passing his/her question paper to another candidate with additional writing on it	
14	The candidate passing incriminating materials brought into the examination hall in any medium (hard/soft) to other candidate(s).	
15	The candidate copying from neighbouring candidate.	
16	The candidate taking out of the examination hall answer booklet(s), used or unused	
17	Appeal by the candidate in the answer script coupled with a promise of any form of consideration.	
18	Candidate destroying evidence relating to an alleged irregularity.	Invalidating the examinations of the subject concerned and all the theory and the practical subjects of the current semester registered by the candidate. Further the candidate is not considered for revaluation of answer scripts of the arrears-subjects. If the candidate has registered for arrears – subjects only, invalidating the examinations of all the arrears – subjects registered by the candidate. **Additional Punishment:** 1. if the candidate has not completed the programme, he/she is debarred from continuing his/her studies for one year i.e., for two subsequent semesters. However the student is permitted to appear for the examination in all the arrears-subjects up to the last semester during the debarred period. 2. if the candidate has completed the programme, he/she is prevented from writing the examinations of the arrears-subjects for two subsequent semesters.
19	Vulgar/offensive writings by the candidate in the answer script.	Invalidating the examinations of all the theory and practical subjects of the current semester and all the arrears –subjects registered by the candidate.
20	The candidate possessing the answering script of another candidate	
21	The candidate passing his /her answer script to another candidate	
22	Involved in any one or more of the malpractices of serial no. 8 to 21 for the second or subsequent times.	Invalidating the examinations of all the theory and practical subjects of the current semester and all the arrears –subjects registered by the candidate.
23	The candidate substituting an answer book let prepared	

	outside the examination hall for the one already distributed to the candidate	**Additional Punishment:** (i) If the candidate has not completed the programme, he/she is debarred from continuing his/her studies for one year i.e., for two subsequent semesters. However the student is permitted to appear for the examination in all the arrears-subjects up to the last semester during the debarred period. (ii) If the candidate has completed the programme, he/she is prevented from writing the examinations of the arrears-subjects for two subsequent semesters.
24	The candidate indulge in any disruptive conduct including, but not limited to, shouting, assault of invigilator, officials or students using abusive and /or threatening language, destruction of property.	Invalidating the examinations of all the theory and practical subjects of the current semester and all the arrears –subjects registered by the candidate. **Additional Punishment:** (i) if the candidate has not completed the programme, he/she is debarred from continuing his/her studies for **two years** i.e., for four subsequent semesters. However the student is permitted to appear for the examination in all the arrears-subjects up to the last semester during the debarred period. (ii) if the candidate has completed the programme, he/she is prevented from writing the examinations of the arrears-subjects for four subsequent semesters.
25	The candidate harass or engage others to harass on his/her behalf an invigilator, official, witnesses or any other person in relation to an irregularity by making telephone calls, visits, mails or by any other means.	
26	Candidate possessing any firearm/weapon inside the examination hall.	
27	Cases of Impersonation	(i)Handing over the impersonator to the police with a complaint to take appropriate action against the person involved in the impersonation by the Chief Supt. (ii)If a student of this University is found to impersonate a 'bonafide student', the impersonating student is debarred from continuing his/her studies and writing the examinations **permanently.** He/she is not eligible for any further admission to any

		programme of the University. (iii)Debarring the 'bonafide student' for whom the impersonation was done from continuing his/her studies and writing the examinations **permanently.** He/she is not eligible for any further admission to any programme of the University.

CONTROLLER OF EXAMINATIONS

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

STUDENTS LEAVE APPLICATION FORM

Department of Electrical and Electronics Engineering

Date:

Name of the Student :

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

No. of days, leave, already availed :

%of Attendance as on : _____ is _____

Date & Day :

Reason for Leave :

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

Recommended / Not Recommended

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

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Recommended / Not Recommended

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

TO Date

The Principal

KLNCE

Pottapalayam

Sub: Requisition for Bonafide Certificate to me

****

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 :