HOLY MARY INSTITUTE OF TECHNOLOGY & SCIENCE

(COLLEGE OF ENGINEERING)

Bogaram (V), Keesara (M), Medchal – 501 301

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

B TECH – II YEAR I-SEM

STUDENT HANDBOOK

A.Y. 2018-19

HOLY MARY INSTITUTE OF TECHNOLOGY & SCIENCE

(COLLEGE OF ENGINEERING)

Bogaram (V), Keesara (M), Medchal – 501 301

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

VISION:

To be a premier institute in the country and region for the study of engineering, technology and management by maintaining high academic standards which promote the analytical thinking and independent judgment among the prime stakeholders enabling them to function responsibly in the globalized society.

MISSION:

- To impart quality professional education that meets the needs of present and emerging technological world.
- To strive for student achievement and success, preparing them for life and leadership with ethics.
- To provide a scholarly and vibrant learning environment that enables faculty, staff and students achieve personal and professional growth.
- To contribute to advancement of knowledge, in both fundamental and applied areas of engineering, technology & management.
- To undertake research and development works by forging alliances with research institutes, government organizations, industries and alumni and become a centre of excellence for quality professional educations and research.

MISSION AND VISION OF THE ECE DEPARTMENT:

Vision: To be a world leader and renowned for Electronics & Communication Engineering and research.

Mission:

M1: To educate graduates in the basic principles underlying the field of Electronics & Communication Engineering.

M2: To train our students to think independently in terms to master systematic approach to problem solving.

M3: To have a keen awareness of the role of engineering in the modern society.

TABLE OF CONTENT

ELECTRICAL TECHNOLOGY:

PROGRAMME: **B.Tech - ECE** AC:YEAR : **2018-2019**	DEGREE: B.TECH II YEAR Ist SEM
COURSE: **ELECTRICAL TECHNOLOGY**	SEMESTER: I COURSE COORDINATOR : **M. RAJA NAYAK**
COURSE CODE: **EC303ES** REGULATION:R16	COURSE TYPE: CORE CREDITS: 3
COURSE AREA/DOMAIN: ELECTRONICS ENGINEERING	CONTACT HOURS: 4 +1(Lectures) hours/Week.
CORRESPONDING LAB COURSE CODE (IF ANY): EC308ES	LAB COURSE NAME: Basic Electrical Engineering Lab

1.1 SYLLABUS:

UNIT	DETAILS	HOURS
I	**D.C Generators and DC Motors:** Principle of operation of DC Machines- EMF equation – Types of generators – Magnetization and load characteristics of DC generators, DC Motors – Types of DC Motors – Characteristics of DC motors – 3-point starters for DC shunt motor – Losses and efficiency – Swinburne's test – Speed control of DC shunt motor – Flux and Armature voltage control methods.	17
II	**Transformers & Performance:** Principle of operation of single phase transformer – types – Constructional features – Phasor diagram on No Load and Load – Equivalent circuit, Losses and Efficiency of transformer and Regulation – OC and SC tests – Predetermination of efficiency and regulation (Simple Problems).	15
III	**Three Phase Induction Motor:** Principle of operation of three-phase induction motors –Slip ring and Squirrel cage motors – Slip-Torque characteristics – Efficiency calculation – Starting methods.	10
IV	**Alternators:** Alternators – Constructional features – Principle of operation – Types - EMF Equation – Distribution and Coil span factors – Predetermination of regulation by Synchronous Impedance Method – OC and SC tests.	10
V	**Special Motors & Electrical Instruments :** Principle of operation - Shaded pole motors – Capacitor motors, AC servomotor, AC tachometers, Synchros, Stepper Motors – Characteristics, Basic Principles of indicating instruments – Moving Coil and Moving iron Instruments (Ammeters and Voltmeters).	12
	TOTAL HOURS	64

PROGRAMME: **II B. Tech** AC:YEAR : **2018-2019**	SEMESTER: **I**
COURSE COORDINATOR : **M. RAJA NAYAK**	DEGREE: **B.TECH**
COURSE : **ELECTRICAL TECHNOLOGY**	BRANCH : **ECE**

1.2 COURSE OBJECTIVE: Objectives of this course are

1. To know the basic principle of DC generators and motors.
2. To know the basic principle of single phase transformers.
3. To understand the basic principle of three-phase induction motor and alternators.
4. To understand the basic principle of special motors and electrical instruments.

COURSE OUTCOMES:

After completion of this course student:

1. To analyze the performance of dc generators and motors.
2. To analyze the performance of transformers.
3. To learn the in-depth knowledge on three phase induction motors.
4. To analyze the performance of special motors and electrical instruments in real time applications.

PROGRAMME EDUCATIONAL OBJECTIVES:

PEO 1: Possess successful careers in Electrical Sciences, and allied areas and pursue higher education with a broad knowledge base in Mathematics and Engineering principles.

PEO-2: Utilize their technical, analytical, communicative and managerial skills and knowledge for societal progress and enrich them to keep in pace with relevant advancements by engaging themselves in lifelong learning

PEO-3: Exhibit professionalism by displaying competence, leadership, dedication and commitment.

1.3 PROGRAMME OUTCOMES:

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

b : Problem analysis: Identify, formulate review research literature and analyze complex engineering problems reaching substantiated conclusions using first principle of mathematics, natural science and engineering science.

c : 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, the cultural, societal, and environmental considerations.

d: 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.

e : 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.

f : 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.

g : 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.

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

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

j :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.

k :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.

l :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.

1.4 CO-PO MAPPING:

Programme Outcomes

Course Outcomes	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l
1	√	√	√		√			√			√	
2	√	√	√		√			√			√	
3	√	√	√		√			√			√	
4	√	√	√		√			√			√	
5	√	√	√		√			√			√	

1.5 LESSON PLAN :

Department: ECE **Academic Year :** 2018-19

Name of Faculty : M. RAJA NAYAK **Year-Semester:** II -I Sem

SUBJECT: ELECTRICAL TECHNOLOGY

	Unit no	Topic	Week	No of sessions planned	Mode of teaching BB/PPT/OHP/MM	Reference *	Remarks
1	I	**D.C Generators and DC Motors**			BB	A3/A4	
2		Principle of operation of DC Machines	1	1		A3/A4	
3		Types of generators & EMF equation	1	3	BB	A3/A4	
4		Magnetization and load characteristics of DC generators, problems	2	3	BB	A3/A4	
5		DC Motors – Types of DC Motor	3	3	BB	A3/A4	
6		Characteristics of DC motors – 3-point starters for DC shunt motor	3	2	BB	A3/A4	
7		Losses and efficiency – Swinburne's test	4	2	BB	A3/A4	
8		Speed control of DC shunt motor – Flux and Armature voltage control methods, problems	4	3	BB	A3/A4	
9	II	**Transformers & Performance**			BB	A3/A4	
10		Principle of operation of single phase transformer,types , Constructional features	5	4	BB	A3/A4	
11		Phasor diagram on No Load and Load	5	3	BB	A3/A4	
12		Equivalent circuit, Losses and Efficiency of transformer and Regulation	6	4	BB	A3/A4	

13		OC and SC tests – Predetermination of efficiency and regulation (Simple Problems).	7	4	BB	A3/A4	
14	III	**Three Phase Induction Motor**			BB	A3/A4	
15		Principle of operation of three-phase induction motors –Slip ring and Squirrel cage motors –	8	3	BB	A3/A4	
16		Slip-Torque characteristics – Efficiency calculation	8	3	BB	A3/A4	
17		Starting methods.simple problems	9	4	BB	A3/A4	
18	IV	**Alternators**			BB	A3/A4	
19		Alternators – Constructional features – Principle of operation	10	2	BB	A3/A4	
20		Types - EMF Equation	11	3	BB	A3/A4	
21		Distribution and Coil span factors ,simple problems	11	3	BB	A3/A4	
22		Predetermination of regulation by Synchronous Impedance Method – OC and SC tests.	12	2	BB	A3/A4	
23	V	**Special Motors & Electrical Instruments**			BB	A3/A4	
24		Principle of operation - Shaded pole motors	12	1	BB	A3/A4	
25		Capacitor motors	13	3	BB	A3/A4	
26		AC servomotor, AC tachometers	13	2	BB	A3/A4	
27		Synchros, Stepper Motors – Characteristics,	14	2	BB	A3/A4	
29		Basic Principles of indicating instruments – Moving Coil and Moving iron Instruments (Ammeters and Voltmeters).	15	4	BB	A3/A4	

***** For the respective topics please choose the proper reference from the list ofTEXT/REFERENCE BOOKS/Webresources in Course Information Sheet.

Text Books A1 - A10

Websites or e-books B1 - B10

BB	Black Board
PPT	Power Point Presentation
OHP	Over Head Projector
MM	Multimedia (Audio - Vedio)

Text Books:

A1	Principles of Electrical Engineering - V.K Mehta, S. Chand Publications
A2	Basic Electrical Engineering - T.K. Nagasarkar and M. S. Sukhija, Oxfo Unive sity Press, 2005
A3	ELECTRICAL TECHNOLOGY– B.L.THERAJ. S.CHAND PUBLICATIONS
A4	Introduction to Electrical Engineering – M.S Naidu and S. Kamakshaiah, TMH Publ.

1.6 ASSIGNMENT QUESTIONS

MID-II

Answer The All Questions **5M**

1. Derive the EMF equation of transformer? Hence derive the voltage ratio?

2. What is the basic principle of DC generator and DC motor with relevant diagram? What is back e.m.f in d.c. motor?

3. Derive the equation for induced E.M.F of a DC machine?
4. Derive the torque equation of DC motor and also equation for condition of maximum torque of a DC motor?

5. Explain the Magnetization and Load characteristics of any three types of DC generators?
6. Explain the characteristics of DC Motors?
7. Explain the efficiency and regulation of the transformer?
8. Explain the principle of operation of the 3-phase Slip Ring and Squirrel cage Induction Motor?
9. Explain the slip-Torque characteristics of 3-phase Induction Motor?

ASSIGNMENT QUESTIONS

MID-II

Answer The All Questions **5M**

1. Derive the torque equation of an induction motor. Mention the condition for maximum torque?
2. Compare DOL starter, Auto transformer starter & Rotor resistance starter with relate to the following: (i) starting current (ii) starting torque?

3. Describe the speed control of IM by rotor resistance control method?
4. Write the EMF equation of an Alternator?
5. Deduce the relation between the number of poles, the frequency and the speed of the synchronous generator?

6. Discuss in detail about the split-phase motors?
7. Discuss about the principle and performance of AC series motor?
8. What is the principle of operation of universal motor and stepper motor?
9. Show that the starting torque of a single phase-phase induction motor is zero?

1.7 QUESTION BANK & BIT BANK:

S.No		QUESTION	BLOOMS TAXONOMY LEVEL	PROGRAM OUTCOME
	UNIT-I **DC MACHINES** **(SHORT ANSWERS)**			
1	State Fleming's Right Hand Rule.		Remember	2
2	State Fleming's Left Hand Rule		Remember	3
3	What is the basic principle of a dc generator?		Remember	2
4	What are the basic parts of a dc generator?		Remember	3
5	Write down the emf equation of a dc generat r		Remember	1
6	What are the different types of dc generators?		Remember	3
7	Draw the circuit diagram of any two types of DC generators.		Remember	3
8	What is back emf in d.c. motor?		Remember	1
9	List out the different types of DC mo or.		Remember	2
10	Write down the torque equation of a D.C motor.		Remember	3
	UNIT-II **Transformers and their performance** **(SHORT ANSWERS)**			
1	Mention the difference between core and shell type transformers.		Evaluate	3
2	What is the purpose of laminating the core in a transformer?		Analyze	2
3	Give the emf equation of a transformer and define each term.		Remember	3

4	Does transformer draw any current when secondary is open? Why?	Understand	2
5	Define voltage regulation of a transformer.	Evaluate	3
6	What are the applications of step-up & step-down transformer?	Evaluate	1
7	How transformers are classified according to their construction?	Evaluate	3
8	Define transformation ratio.	Evaluate	3
9	Define voltage regulation of a transformer.	Evaluate	1
10	Explain mutual induction principle	Evaluate	2

(LONG ANSWER TYPE QUESTIONS)

S.No.		QUESTION	BLOOMS TAXONOMY LEVEL	OUTCOME
	UNIT-I **DC MACHINES**			
1	Explain the principle of operation of DC generator.		Understood	3
2	Give the classification of DC generator and explain		Remember	3
3	Derive the equation for induced EMF of a DC machine.		Remember	3
4	Derive the torque equation of DC motor.		Apply	3
5	Explain the principle of operation of DC Motor.		Apply	3
6	Give the classification of DC Motor and explain		Apply	3
7	Give the significance of back emf in a DC motor.		Apply	3
8	Explain about Swinburne's test of Dc shunt machine		Apply	3
9	Explain the speed control techniques of DC shunt motor		Apply	3
10	Differentiate between self-excited and separately excited d.c. machines.		Apply	3
	UNIT-II			
	Transformers and their performance			
1	Describe the construction details of transformer.		Creating &analyse	3
2	Explain the principle of operation of transformer.		Analyse	3

3	Derive the EMF equation of a transformer.	Apply	2
4	Explain the principle of operation of single phase 2-win ing transformer.	Evaluate	2
5	Explain the losses in a Transformer	Remember &Evaluate	3
6	Obtain the condition for maximum efficiency f a transformer	Understand	3
7	Explain the OC test of a single phase transformer	Understand	3
8	Obtain the equivalent circuit of a single phase transformer	Understand	3
9	Explain the ON load co dition of a transformer	Creating &analyse	3
10	Explain the NO load condition of a transformer	Evaluate	3

S.No	QUESTION		BLOOMS TAXONOMY LEVEL	COURSE OUTCOME
	UNIT-II **SINGLE PHASE TRANSFORMERS**			
1	Mention the differences between core and shell type transformers.		Evaluate	1
2	Give the emf equation of a transformer and define each term		Apply	1
3	What are the applications of step-up & step-do n transformer?		Apply	1
4	What types of cores are used for transformers?		Evaluate	1
5	Discuss the purpose of Oil used in the transformer.		Understand	1
6	On what size the construction of bushings in a transformer depend?		Evaluate	1
7	Discuss about copper losses in a transformer.		Analyze	1
8	Discuss about Eddy current loss in transformer.		Analyze	1
9	Discuss about Hysteresis loss in a transformer.		Analyze	3
10	Discuss all day efficiency		Analyze	3
11	Define voltage regulation of a transformer. What causes a change in		Remember	3

	secondary terminal voltage of transformer as it is loaded?			
12	Does the transformer draw any current when secondary is open		Apply	3
13	Differentiate a classical transformer with an auto transformer.		Apply	3
14	Discuss whether the transformers can be used in parallel		Analyse	3
15	What is impedance in transformers?		Evaluate	3

16	Why is the short circuit test performed at reduced voltage on the HV side?	Understand	3
17	Is the sumpner's test data used for pre-determination of regulation of transformer? Justify the answer.	Remember	3
18	State any two important conditions to be satisfied for satisfactory and successful operation of transformers connected in parallel.	Evaluate	3
19	Is the efficiency of a transformer same at the same load at 0.8 pf lag and 0.8 pf lead?	Remember	3
	UNIT-1II **THREE-PHASE INDUCTION MOTORS** **(SHORT ANSWER TYPE QUESTIONS)**		
1	In a 3 – phase induction motor running at slip ‘s’ the mechanical power developed in terms of input power P2 is.	Evaluate	1
2	What do you mean by AC three-phase ind ction motor?	Understand	1
3	On what principle does the induction motor work?	analyze	3
4	What are the types of induction motors?	Evaluate	3
5	What are the main parts of AC three-phase induction motor?	Evaluate	3
6	The starting torque of a three-phase induction motor can be increased by increasing what?	Apply	3
7	In a poly phase squirrel-cage induction motor, increased starting torque can be obtained by	Apply	3
8	The ratio among rotor input, rotor output and rotor Cu losses are?	analyze	3
9	How a rotor rotates in an Induction motor? Explain.	Remember	3

14	Suggest a suitable test to predetermine the efficiency of a transformer and discuss it?	Apply	3
15	Describe the method by which the separation of the core losses of a transformer is achieved.	Analyze	3
16	With the help of neat experimental circuit, explain how Sumpner's test is carried out on a pair of single phase transformer.	Evaluate	3
17	Derive an expression for load sharing between two transformer operating in parallel with equal voltage ratios.	Evaluate	3
18	Derive an expression for load sharing between two transformer operating in parallel with unequal voltage ratios.	Evaluate	3
	UNIT-III **THREE-PHASE INDUCTION MOTORS** **(LONG ANSWER TYPE QUESTIONS)**		
1	Describe the principle construction and operation of Induction motor.	Understand	2
2	Discuss the various losses taking place in IM. Explain the effect of slip on the Performance of IM.	understand	2
3	Derive the torque equation of an induction motor. Mention the condition for maximum torque.	analyze	3
4	Describe how rotating magnetic field is developed in induction motor.	understand	2
5	Discuss the following (a) How torque is developed in the rotor of a induction motor. (b) Why in some induction motors double cages are provided?	understand	2
6	Why the rotor of a poly phase induction motor can never attain synchronous speed? Discuss.	understand	2
7	Describe the constructional features of both slip ring and squirrel cage	Understand	2

	induction motor. Discuss the merits of one over the other.		
8	With neat diagram describe the equivalent circuit of 3phase Double Cage IM.	analyze	2
9	Draw the phasor diagram of an Induction motor and explain.	analyze	2
10	With a neat sketch discuss the principle of operation of double cage Induction motor Briefly explain the torque slip characteristics of an Induction motor.	understand	3
11	With neat diagram discuss the various tests to be conducted on 3phase IM to plot the circle diagram.	Apply	3
12	Compare DOL starter, Auto transformer starter & Rotor re-sistance starter with relate to the following: (i) starting current (ii) starting torque.	Evaluate	3
13	Calculate the minimum torque. Assume stator and rotor copper losses equal at standstill.	Evaluate	3
14	Describe the speed control of IM by rotor resistance control method. How this method of speed control is different from stator side speed control methods	Evaluate	3
15	Compare the speed control of 3phase IM by rotor resistance control & variable frequency control	Apply	3
16	What happens if the emf is injected to the rotor circuit of inducti n motor?	Analyse	2
17	With the help of experimental circuit, describe how the equivalent circuit parameters are determined by no load and blocked rotor tests on 3 phase Induction motor.	Apply	3
18	With the help of a neat diagram, describe the w king of a star - delta starter.	Apply	3

S.No	QUESTION	BLOOMS TAXONOMY LEVEL	COURSE OUTCOME

	SHORT ANSWER TYPE QUESTIONS UNIT-IV ALTERNATORS		
1	State different type of synchronous generat rs used in hydro electrical power station.	Evaluate	3
3	Write the EMF equation of an Alternator.	Remember	2
4	What is the speed of a 4 pole 50Hz Synchronous machine?	Remember	2
5	Define Synchronous speed.	Remember	1
6	How can a DC generator be converted into an alternator?	Remember	2
7	Discuss about armature reaction in synchronous generator	Understand	1
8	Define distribution factor.	Understand	1
9	Define pitch factor.	Remember	3
10	Define winding factor.	Remember	3
11	Write different methods for determining the voltage regulation of synchronous generator.	Remember	3
12	Define regulation of Alternator.	Remember	3
113	What are the components of synchronous impedance?	Remember	3
14	Discuss the importance of synchronous impedance method	Remember	3
15	Discuss two reaction analysis	Remember	3
16	Define Xd and Xq	Remember	3
17	Why voltage regulation calculated by Potier's method is somewhat lower?	Remember	3
18	What are the parameters can be determined from slip test	Understand	2

SHORT & LONG ANSWER TYPE QUESTIONS:

UNIT-IV

ALTERNATORS

	QUESTION	BLOOMS TAXONOMY LEVEL	COURSE OUTCOME
1	Deduce the relation between the number of poles, the frequency	Apply	1

	and the		
	speed of the synchronous generator		
2	What are the causes of harmonics in the voltage waveform of an alternator?	Understand	1
3	What is an armature reaction? Explain its effect on the terminal voltage of an alternator at unity power factor load.	Understand	1
4	In brief, derive an expression for the winding factor of an alternator	Apply	2
5	Derive EMF equation and describe how the induced 'emf' in armature	Apply	2
	winding is affected by (a) form factor (b) pitch factor and(iii) distribution factor		
6	Discuss about the determination of synchronous reactance of an alternator	Understand	2
7	Draw the load characteristics of synchronous generator and describe the same	Apply	2
8	What is the difference between integral slot and fractional slot windings	Understand	1
9	With phasor diagram, discuss about the leakage reactance of synchronous generator	Apply	1
10	Compute the distribution factor for a 36-slot, 4-pole, single-layer 3-Phase winding.	Apply	2
1	Discuss in brief, how voltage regulation can be computed by synchronous impedance method	Understand	2
2	Discuss in brief about the two-reaction analysis f a salient-pole synchronous machine	Understand	2
3	With relevant waveforms and connection diagram, describe the slip test of synchronous machine	Apply	3
4	What is the significance of zero power-factor characteristics of an alternator?	Apply	2
5	Describe why, synchronous impedance method of computing the voltage regulation, leads to a pessimistic value at lagging power factor loads	Understand	3
6	Describe how, open-circuit and short-circuittests are conducted on a synchronous machine	Understand	3
7	Discuss in brief, how voltage regulation can be computed by MMF method.	Understand	3

8	Discuss in brief, how voltage regulation can be computed by ASA method.	Understand	3
9	Discuss in brief, how voltage regulation can be computed for salient pole alternators.	Understand	3
10	A synchronous generator has X_d=0.75 pu and X_q=0.5 pu. It is supplying	Apply	2
	full-load at rated voltage at 0.8 lagging power factor. Draw the phasor diagram and compute the excitation emf		
	SHORT ANSWER TYPE **UNIT-V** **SINGLE PHASE MOTORS & SPECIAL MACHINES**		
1	Discuss in detail about the split-phase motors	Understand	3
2	Discuss about the principle and performance of AC series motor	Understand	3
3	Describe the phase control of 1-phase induction motor	Remember	2
4	Write a short notes on double revolving field theory	Remember	2
5	Discuss about Torque-Speed curve of single-phase induction motor	Apply	3
6	Show that the starting torque of a single phase-phase induction motor is zero	Apply	3
7	With a neat sketch, discuss about the operation of shaded pole motor with squirrel cage rotor	Understand	3
8	What type of operating characteristics does an ac series motor give?	Understand	3
9	What is the principle of operation of universal motor?	Understand	3
10	What is the principle of operation of stepper motor?	Understand	3
	LONG ANSWER TYPE **UNIT-IV** **SYNCHRONOUS MACHINES AND CHARACTERISTICS**		
1	Calculate the speed and open-circuit line and phase voltages of a 4-pole,3- phase,50hz star-connected alternator with 36 slots	Evaluate	3

	and 30 slots 30 conductors per slot. The flux per pole is 0.05wb		
2	A 4-ploe, 50hz star-connected alternator has a flux per pole of 0.12wb. it has 4 slots per pole per phase, conductors per slot being 4.if the winding coil span is 150^0,find the emf.	Apply	2
3	A 3-phase,8-pole,750rpm star-connected alternator has 72 slots on the armature. Each slot has 12 conductors and winding is short-pitched by 2 slots. Find the induced emf between lines, given the flux per pole is 0.06wb	Apply	2
4	An 8-pole,3-phase,60^0 spread, double layer winding has 72 coils in 72 slots. The coils are short-pitched by two slots. Calculate the winding factor for the fundamental and third harmonic.	Evaluate	3
5	The stator of a 3-phase,20-pole alternator has 120 slots and there are 4 conductors per slot accommodated in two layers. If the speed of the alternator is 300rpm, calculate the emf induced per phase. Resultant flux in the air-gap is 0.05 wb per pole. Assume the coil span as 160^0 electrical.	Evaluate	3
6	A star-connected,3-phase,6-pole alternator has a stator with 90 slots and 8 conductors per slot.the rotor revolves at 1000rpm. The flux per p le is $4x10^{-2}$ wb. calculate the emf generated if all the conductors in each phase are in series. Assume sinusoidal flux distribution and full-pitched coils.	Evaluate	3
7	A 16 pole,3-phase alternator has a star-connected wining with 144 slots and10 conductors per slot. The flux per pole is 0.03wb istributed sinusoidally and the speed is 375 rpm. Find the line voltage, if the coil span is 150^0 elec.	Apply	2
8	A 3-phase,16-pole alternator has the f ll wing data:number of slots=192,conductors per slot=8,coil span 10 slots;	Evaluate	3

	speed of alternator=375rpm;flux per pole =55mwb.calculate the phase and line voltage.		
9	For a 3-Φ winding with 4 slots per pole phase and with the coin span of 10slot pitch, calculate the values of the distribution factor and coil span factor.	Evaluate	3
10	An 8-pole ac generator is ru i g at 750rpm. What is the frequency? At whatspeed must the generator be run so that frequency shall be 25hz?	Apply	2
11	A 3-phase star-connected synchronous generator is rated at 1.4MVA, 11KV. the armature effective resistance and synchronous reactance are 1.2 Ω and25Ω respectively per phase. Calculate the percentage voltage regulation for a load of 1.4375MVA at (i) 0.8pf lagging and (ii) 0.8pf leading. also find out the pf at hich the regulation becomes zero.	Apply	2
12	A 3-phase, star-connected alternator is rated at 1600kva, 13500v. The armature resistance and synchronous reactance are 1.5 Ω and 30Ω respectively per phase. Calculate the percentage regulation for a load of1280kw at 0.8leading power factor.	Apply	2
13	From the following test results, determine the regulation of a 2 KV single phase alternator, delivering a current of 100 A at 0.8 p.f. leading test results; full load current of 100 A is produced on short circuit by a field excitation of 2.5 A. An emf of 500 V is produced on open circuit by the same field current. The armature resistance is 0.8 ohms.	Apply	2

LONG ANSWER TYPE QUESTIONS

UNIT-V

SPECIAL MOTORS

S.NO	QUESTION	BLOOMS TAXONOMY LEVEL	COURSE OUTCOME
1	A stepper motor driven by a bipolar drive circuit has the following parameters: winding inductance = 30 mH, rated current = 3A, DC supply = 45V, total resistance in each phase = 15Ω. When		3

	the transistors are turned off, determine (i) the time taken by the phase current to decay to zero and (ii) the proportion of the stored inductive energy returned to the supply.	Evaluate	
2	A stepper motor has a step angle of 3°. Determine (a) resolution (b) number of steps required for the shaft to make 25 revolutions and (c) shaft speed, if the stepping frequency is 3600 pps.	Apply	2
3	A stepper motor has a step angle of 1.8°. What number should be loaded into the encoder of its drive system if it is desired to turn on the shaft ten complete revolutions?	Evaluate	3
4	What is the motor torque T_m required to accelerate an initial load of $3*10^{-4}$ kgm^2 from f_1 = 1000 Hz to f_2 = 2000 Hz during 100 ms. The frictional torque T_f is 0.05 N-m and the step angle is 1.8 .	Apply	2
5	A 250W single phase 50hz 220v universal motor runs at 2000rpm and takes 1)A when supplied from a 220V dc supply. If the motor is connected to 220Vac supply and takes 1A(r m s), calculate the speed, torque and power factor, assume Ra=20Ω and La=0.4H	Evaluate	3
6	A universal series motor has a resistance of 30Ω and an inductance of 0.5H. when connected to a 250V DC supply and loaded to take 0.8A,it ns at 2000rpm. Estimate its speed and power factor when connected to a 250V, 50hz ac supply and loaded to take the same current.	Evaluate	3
7	Find the mechanical power output of 185kw, 4 pole, 110V, 50Hz single phase induction motor, whose constants are given below at a slip of 0.05. R1=1.86Ω, X1=2.56 Ω, Xϕ=53.5 Ω, R2=3.56 Ω X2=2.56 Ω core loss 3.5w, friction and wind age loss 13.5w	Evaluate	3
8	A 250w, 230V, 50Hz capacitor start motor has the f llowing constants for the main and auxiliary windings: main winding, Zm=(4.5+3.7i)Ω. Auxiliary winding Za=(9.5+3.5i)Ω. Determine the value of the starting capacitor that will place the main and auxiliary winding currents in quadrature at starting.	Evaluate	3
9	A single phase induction motor has s ator windings in space quadrature and is supplied with a single phase vol age of 200V at 50Hz. The standstill	Apply	2

	impedance of the main wi di g is (5.2+10.1i) and the auxiliary winding is (19.7+14.2i). find the value of capacitance to be inserted in the auxiliary winding for maximum starting torque.		

1.8 OBJECTIVE TYPE QUESTION BANK

UNIT-I

DC GENERATORS AND DC MOTORS

1. Armature reaction in a generator results in

- (A) Demagnetization of leading pole tip and magnetization of trailing pole tip
- (B) Demagnetization of trailing pole tip and magnetization of leading pole tip
- (C) Demagnetizing the center of all poles
- (D) Magnetizing the center of all poles

ANS: A

2. The essential condition for parallel operation of two D.C. generators is that they have

- (A) Same kW rating
- (B) The same operation r.p.m.
- (C) The same drooping voltage characteristics
- (D) Same percentage regulation

ANS: C

3. The commutator segments are connected to the armature conductors by means of

- (A) Copper lugs
- (B) Resistance wires
- (C) Insulation pads
- (D) Brazing

ANS: A

4. Copper brushes in D.C. machine are used

- (A) Where low voltage and high currents are involved
- (B) Where high voltage and small currents are involved
- (C) In both of the above cases
- (D) In none of the above cases

ANS: A

5. Armature reaction of an unsaturated D.C. machine is

- (A) Cross-magnetizing
- (B) Demagnetizing
- (C) Magnetizing
- (D) None of above

ANS: A

6. In D.C. generators, lap winding is used for

- (A) High voltage, high current
- (B) Low voltage, high current
- (C) High voltage, low current
- (D) Low voltage, low current

ANS: B

7. If a D.C. generator fails to build up the probable cause could not be

- (A) Imperfect brush contact
- (B) Field resistance less than the critical resistance
- (C) No residual magnetism in the generator
- (D) Faulty shunt connections tending to reduce the residual magnetism

ANS: B

8. An exciter for a turbo generator is a

- (A) Separately excited generator
- (B) Shunt generator
- (C) Series generator
- (D) Compound generator

ANS: B

9. The critical resistance of the D.C. generator is the resistance of

- (A) Field
- (B) Brushes
- (C) Armature
- (D) Load

ANS: A

10. With a D.C. generator which of the following regulation is preferred?

- (A) 100% regulation

(B) Infinite regulation

(C) 50% regulation

(D) 1% regulation

ANS: D

11. In a D.C. machine stray loss is the sum of

(A) Total copper loss and mechanical loss

(B) Armature copper loss and iron loss

(C) Shunt field copper loss and mechanical loss

(D) Iron loss and mechanical loss

ANS: D

12. Which of the following generator will have negligible terminal voltage while running on no-load?

(A) Series generator

(B) Shunt generator

(C) Compound generator

(D) Separately excited generator

ANS: A

13. In a separately excited generator supplying rated load the armature reaction:

(A) Is always present

(B) Is always absent

(C) May be sometimes present

(D) None of the above

ANS: A

14. When two D.C. series generators are running in parallel, an equalizer bar is used

(A) To increase the speed and hence generated e.m.f.

(B) To increase the series flux

(C) So that two similar machines will pass approximately equal currents to the load

(D) To reduce the combined effect of armature reaction of both machines

ANS: C

15. A D.C. generator works on the principle of

(A) Lenz's law

(B) Ohm's law

(C) Faraday's law of electromagnetic induction

(D) None of the above

ANS: C

16. Two D.C. shunt generators, each with armature resistance of 0.02 ohm and field resistance of 50 ohm run in parallel and supply a total current of 1000 amperes to the load circuit. If their e.m.fs. are 270 V and 265 V, their bus bar voltage will be

(A) 270 V

(B) 267.5 V

(C) 265 V

(D) 257.4 V

ANS: B

17. In a D.C. generator the critical resistance can be increased by

(A) Increasing its field resistance

(B) Decreasing its field resistance

(C) Increasing its speed

(D) Decreasing its speed

ANS: C

18. For both lap and wave windings, there are as many commutator bars as the number

(A) Slots

(B) Armature conductors

(C) Winding elements

(D) Poles

ANS: C

19. In case of D.C. machine winding, number of commutator segments is equal to

(A) Number of armature coils

(B) Number of armature coil sides

(C) Number of armature conductors

(D) Number of armature turns

ANS: A

20. A D.C. welding generator has

(A) Lap winding

(B) Wave moving

(C) Duplex winding

(D) Any of the above

ANS: A

21. A three point starter is considered suitable for

- (A) Shunt motors
- (B) Shunt as well as compound motors
- (C) Shunt, compound and series motors
- (D) All D.C. motors

ANS: B

22. Which D.C. motor has got maximum self loading property?

- (A) Series motor
- (B) Shunt motor
- (C) Cumulatively compounded motor
- (D) Differentially compounded motor

ANS: D

23. Sparking at the commutator of a D.C. motor may result in

- (A) Damage to commutator segments
- (B) Damage to commutator insulation
- (C) Increased power consumption
- (D) All of the above

ANS: D

24. Following motor is used where high starting torque and wide speed range control is required.

- (A) Single phase capacitor start
- (B) Induction motor
- (C) Synchronous motor
- (D) D.C. motor

ANS: D

25. The armature voltage control of D.C. motor provides

- (A) Constant torque drive
- (B) Constant voltage drive
- (C) Constant current drive
- (D) None of the above

ANS: A

26. Which one of the following is not necessarily the advantage of D.C. motors over A.C. motors?

- (A) Low cost
- (B) Wide speed range
- (C) Stability
- (D) High starting torque

ANS: A

27. If a D.C. motor designed for 40°C ambient temperature is to be used for 50°C ambient temperature, then the motor

- (A) Of lower H.P. should be selected
- (B) Of higher H.P. should be selected
- (C) Can be used for 50°C ambient temperature also
- (D) Is to be de-rated by a factor recommended by manufacturer and select the next higher H.P. motor

ANS: D

28. Which motor should not be started on no-load?

- (A) Series motor
- (B) Shunt motor
- (C) Cumulatively compounded motor
- (D) Differentially compounded motor

ANS: A

29. The losses occurring in a D.C. generator are given below. Which loss is likely to have highest proportion at rated load of the generator?

- (A) Hysteresis loss
- (B) Field copper loss
- (C) Armature copper loss
- (D) Eddy current loss

ANS: C

30. Which of the following losses are significantly reduced by laminating the core of a D.C. generator?

- (A) Hysteresis losses
- (B) Eddy current losses
- (C) Copper losses

(D) Windage losses

ANS: B

UNIT-II

SINGLE PHASE TRANSFORMERS

1. A transformer cannot raise or lower the voltage of a D.C. supply because

(A) There is no need to change the D.C. voltage

(B) A D.C. circuit has more losses

(C) Faraday's laws of electromagnetic induction are not valid since the rate of change of flux is zero

(D) None of the above

ANS: B

2. The primary coil of a transformer is connected to a 60 V ac source. The secondary coil is connected to a 330 Ω load. The turns ratio is 3:1. What is the secondary voltage?

(A) 2 V

(B) 20 V

(C) 180 V

(D) 18 V

ANS: B

3. In a certain transformer, the input power to the primary is 120 W. If 8.5 W are lost to the winding resistance, what is the output power to the load, neglecting any other issues?

(A) 0 W

(B) 14.1 W

(C) 111.5 W

(D) 1,020 W

ANS: B

4. While conducting short-circuit test on a transformer the following side is short circuited

(A) High voltage side

(B) Low voltage side

(C) Primary side

(D) Secondary side

ANS: B

5. In the transformer the function of a conservator is to

(A) Provide fresh air for cooling the transformer

(B) Supply cooling oil to transformer in time of need

(C) Protect the transformer from damage when oil expends due to heating

(D) None of the above

ANS: B

6. The purpose of providing iron core in a step-up transformer is

(A) To provide coupling between primary and secondary

(B) To increase the magnitude of mutual flux

(C) To decrease the magnitude of magnetizing current

(D) To provide all above features

ANS: B

7. A transformer has a 1:6 turns ratio and a secondary coil load resistance of 470 Ω. The load resistance as seen by the source is

(A) 1.3 Ω

(B) 7.8 Ω

(C) 78 Ω

(D) 13 Ω

ANS: B

8. The noise resulting from vibrations of laminations set by magnetic forces, is termed as

(A) Magnetostriction

(B) Boo

(C) Hum

(D) Zoom

ANS: B

9. Distribution transformers are generally designed for maximum efficiency around

(A) 90% load

(B) Zero load

(C) 25% load

(D) 50% load

ANS: B

10. Which of the following is not a routine test on transformers?

(A) Core insulation voltage test

(B) Impedance test

(C) Radio interference test

(D) Polarity test

11. Which of the following properties is not necessarily desirable for the material for transformer core?

(A) Low hysteresis loss

(B) High permeability

(C) High thermal conductivity

(D) Adequate mechanical strength

ANS: C

12. Gas is usually not liberated due to dissociation of transformer oil unless the oil temperature exceeds

(A) 50°C

(B) 80°C

© 100°C

(D) 150°C

ANS: D

13. Material used for construction of transformer core is usually

(A) Wood

(B) Copper

© Aluminium

(D) Silicon steel

ANS: D

14. A transformer

(A) Changes ac to dc

(B) Changes dc to ac

© Steps up or down dc voltages

(D) Steps up or down ac voltages

ANS: D

15. The mutual inductance when k = 0.65, L_1 = 2 Mh, and L_2 = 5 Mh is

- (A) 2 Mh
- (B) 2 Mh
- © 4 Mh
- (D) 8 Mh

ANS: B

16. What Kva rating is required for a transformer that must handle a maximum load current of 8 A with a secondary voltage of 2 Kv?

- (A) 4 Kva
- (B) 0.25 Kva
- © 16 Kva
- (D) 8 Kva

ANS: C

17. If the percentage impedances of the two transformers working in parallel are different, then

- (A) Transformers will be overheated
- (B) Power factors of both the transformers will be same
- © Parallel operation will be not possible
- (D) Parallel operation will still be possible, but the power factors at which the two transformers operate will be different from the power factor of the common load

ANS: D

18. A transformer consists of two or more cores that are electrically coupled on a common core.

- (A) True
- (B) False

ANS: B

19. If the voltage is stepped up, the current is stepped down, and vice versa.

- (A) True
- (B) False

ANS: A

20. A transformer oil must be free from

- (A) Sludge
- (B) Odour
- © Gases
- (D) Moisture

ANS: D

UNIT-III

THREE PHASE INDUCTION MOTORS

1. Which of the following methods is easily applicable to control the speed of the squirrel-cage induction motor?

- (A) By changing the number of stator poles
- (B) Rotor rheostat control
- (C) By operating two motors in cascade
- (D) By injecting e.m.f. in the rotor circuit

ANS: A

2. Step-less speed control of induction motor is possible by which of the following methods?

- (A) e.m.f. injection in rotor eueuit
- (B) Changing the number of poles
- (C) Cascade operation
- (D) None of the above

ANS: B

3. In a three-phase induction motor, the number of poles in the rotor winding is always

- (A) Zero
- (B) More than the number of poles in stator
- (C) Less than number of poles in stator
- (D) Equal to number of poles in stator

ANS: D

4. Slip of an induction motor is negative when

- (A) Magnetic field and rotor rotate in opposite direction

(B) Rotor speed is less than the synchronous speed of the field and are in the same direction

(C) Rotor speed is more than the synchronous speed of the field and are in the same direction

(D) None of the above

ANS: C

5. As load on an induction motor goes on increasing

(A) Its power factor goes on decreasing

(B) Its power factor remains constant

(C) Its power factor goes on increasing even after full load

(D) Its power factor goes on increasing up to full load and then it falls again

ANS: D

6. A 3-phase slip ring motor has

(A) Double cage rotor

(B) Wound rotor

(C) Short-circuited rotor

(D) Any of the above

ANS: B

7. In a three-phase induction motor

(A) Power factor at starting is high as compared to that while running

(B) Power factor at starting is low as compared to that while running

(C) Power factor at starting in the same as that while running

(D) None of these

ANS: D **ANS:** B

8. The complete circle diagram of induction motor can be drawn with the help of data found from

(A) No-load test

(B) Blocked rotor test

(C) Stator resistance test

(D) All of the above

ANS: D

9. An induction motor can run at synchronous speed when

- (A) It is run on load
- (B) It is run in reverse direction
- (C) It is run on voltage higher than the rated voltage
- (D) e.m.f. is injected in the rotor circuit

ANS: D

10. Insertion of resistance in the rotor of an induction motor to develop a given torque

- (A) Decreases the rotor current
- (B) Increases the rotor current
- (C) Rotor current becomes zero
- (D) Rotor current remains same

ANS: D

11.Reduced voltage starter can be used with

- (A) Slip ring motor only but not with squirrel cage induction motor
- (B) Squirrel cage induction motor only but not with slip ring motor
- (C) Squirrel cage as well as slip ring induction motor
- (D) None of the above

ANS: C

12. Insertion of resistance in the stator of an induction motor

- (A) Increases the load torque
- (B) Decreases the starting torque
- (C) Increases the starting torque
- (D) None of the above

ANS: B

13. The injected e.m.f. in the rotor of induction motor must have

- (A) Zero frequency
- (B) The same frequency as the slip frequency
- (C) The same phase as the rotor e.m.f.
- (D) High value for the satisfactory speed control

ANS: B

14. Star-delta starting of motors is not possible in case of

- (A) Single phase motors
- (B) Variable speed motors
- (C) Low horse power motors
- (D) High speed motors

ANS: A

15. Which of the following component is usually fabricated out of silicon steel?

- (A) Bearings
- (B) Shaft
- (C) Stator core
- (D) None of the above

ANS: C

16. In three-phase squirrel-cage induction motors

- (A) Rotor conductor ends are short-circuited through slip rings
- (B) Rotor conductors are short-circuited through end rings
- (C) Rotor conductors are kept open
- (D) Rotor conductors are connected to insulation

ANS: B

17. In an induction motor the relationship between stator slots and rotor slots is that

- (A) Stator slots are equal to rotor slots
- (B) Stator slots are exact multiple of rotor slots
- (C) Stator slots are not exact multiple of rotor slots
- (D) None of the above

ANS: C

18. The starting torque of a 3 phase squirrel cage induction motor is

- (A) Twice the full load torque
- (B) 1.5 times the full load torque
- (C) Equal to full load torque
- (D) Any of the above

ANS: B

19. The stating torque of the slip ring induction motor can be increased by adding

- (A) External inductance to the rotor

(B) External resistance to the rotor

(C) External capacitance to the rotor

(D) Both resistance and inductance to rotor

ANS: B

20. In an induction motor if air-gap is increased

(A) The power factor will be low

(B) Windage losses will be more

(C) Bearing friction will reduce

(D) Copper loss will reduce in an induction motor

ANS: A

UNIT-IV

ALTERNATORS

1. Polyphase generators produce simultaneous multiple sinusoidal voltages that are separated by

(A) Certain constant phase angles

(B) Certain constant frequencies

(C) Certain constant voltages

(D) Certain constant currents

ANS: A

2. In a Y-connected source feeding a Δ-connected load,

(A) Each phase of the load has one-third of the full line voltage across it

(B) Each phase of the load has two-thirds of the full line voltage across it

(C) Each phase of the load has the full line voltage across it

(D) Each phase of the load has a voltage across it equal to $\sqrt{3}$

ANS: C

3. A two-phase generator is connected to two 90 Ω load resistors. Each coil generates 120 V ac. A common neutral line exists. How much current flows through the common neutral line?

(A) 1.33 A

(B) 1.88 A

(C) 2.66 A

(D) 1.77 A

ANS: D

4. In a Δ-connected source feeding a Y-connected load

(A) Each phase voltage equals the difference of the corresponding load voltages

(B) Each phase voltage equals the corresponding load voltage

(C) Each phase voltage is one-third the corresponding load voltage

(D) Each phase voltage is 60° out of phase with the corresponding load voltage

ANS: A

5. In a Y-connected generator, there is a 120° difference between each line voltage and the nearest phase voltage.

(A) True

(B) False

ANS: B

6. A simple two-phase generator consists of two conductive loops separated by 90°, rotating in a magnetic field.

(A) True

(B) False

ANS: A

7. 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 15 Ω.

(A) Single-phase 32 A; three-phase 16 A

(B) Single-phase 16 A; three-phase 8 A

(C) Single-phase 8 A; three-phase 4 A

(D) Single-phase 16 A; three-phase 0 A

ANS: B

8. A three-phase Δ-connected generator is driving a balanced load such that each phase current is 12 A in magnitude. When $I\ \theta_a = 12\ \angle 30°$ A, what are the polar expressions for the other phase currents?

- (A) $I_{\theta}b = 12\ \angle 150°$ A, $I_{\theta}c = 12\ \angle -90°$ A
- (B) $I_{\theta}b = 12\ \angle 120°$ A, $I_{\theta}c = 12\ \angle 30°$ A
- (C) $I_{\theta}b = 12\ \angle 30°$ A, $I_{\theta}c = 12\ \angle 120°$ A
- (D) $I_{\theta}b = 12\angle\ 90°$ A, $I_{\theta}c = 12\ \angle 90°$ A

ANS: A

9. In a Δ-connected generator, there is a 120° difference between each line current and the nearest phase current.

- (A) True
- (B) False

ANS: B

10. In a Y-Y source/load configuration, the

- (A) Phase current, the line current, and the load current are all equal in each phase
- (B) Phase current, the line current, and the load current are 120° out of phase
- (C) Phase current and the line current are in phase, and both are 120° out of phase with the load current
- (D) Line current and the load current are in phase, and both are out of phase with the phase current

ANS: A

11.In a Y-connected circuit, the magnitude of each line current is

- (A) One-third the phase current
- (B) Three times the corresponding phase current
- (C) Equal to the corresponding phase current
- (D) Zero

ANS: C

12. In a balanced three-phase load, each phase has

- (A) An equal amount of power
- (B) One-third of total power

(C) Two-thirds of total power

(D) A power consumption equal to $(\sqrt{3}V_L)\ I_L$

ANS: A

13. The most common type of ac motor is the

(A) Single-phase induction motor

(B) Two-phase induction motor

(C) Three-phase induction motor

(D) Two-phase squirrel-cage motor

ANS: C

14. The term 'squirrel-cage' applies to a type of three-phase ac generator.

(A) True

(B) False

ANS: A

15. Polyphase is characterized by two or more sinusoidal voltages, each having a different phase angle.

(A) True

(B) False

ANS: A

16. If in a Y-connected ac generator, each phase voltage has a magnitude of 90 V_{RMS}, what is the magnitude of each line voltage?

(A) 0 V

(B) 90 V

(C) 156 V

(D) 180 V

ANS: C

17. An alternator is an electromechanical ac generator.

(A) True

(B) False

ANS: B

18. In a certain three-wire Y-connected generator, the phase voltages are 2 kV. The magnitudes of the line voltages are

- (A) 2,000 V
- (B) 6,000 V
- (C) 666 V
- (D) 3,464 V

ANS: D

19. In a three-phase system, the voltages are separated by

- (A) 45°
- (B) 90°
- (C) 120°
- (D) 180°

ANS: C

20. Power is measured in a three-phase load by using an ammeter.

- (A) True
- (B) False

ANS: B

UNIT-V

SINGLE PHASE INDUCTION MOTORS

1. A pony motor is used for the starting which of the following motors?

- (A) Squirrel cage induction motor
- (B) Schrage motor
- (C) Synchronous motor
- (D) None of the above

ANS: C

2. Starting winding of a single phase motor of a refrigerator is disconnected from the circuit by means of a

- (A) Magnetic relay
- (B) Thermal relay
- (C) Centrifugal switch
- (D) None of the above

ANS: A

3. In case of a reluctance motor, when the load is increased so that it cannot maintain synchronous speed the motor will

- (A) Become unstable
- (B) Draw excessive armature current and may burn out
- (C) Fall out of synchronism and come to stand still
- (D) Run as induction motor

ANS: D

4. Speed control of a universal motor is achieved by

- (A) Varying field flux with tapped field windings
- (B) Connecting rheostat in series
- (C) Applying variable voltage by means of silicon controlled rectifier
- (D) All of the above methods

ANS: D

5. The starting winding of a single-phase motor is placed in

- (A) Armature
- (B) Field
- (C) Rotor
- (D) Stator

ANS: D

6. The running winding of a single phase motor on testing with Meggar is found to be ground. Most probable location of the ground will be

- (A) At the end connections
- (B) At the end terminals
- (C) Anywhere on the winding inside a slot
- (D) At the slot edge where coil enters or comes out of the slot

ANS: D

7. Short-circuiter is used in

- (A) Repulsion induction motor
- (B) Repulsion motor
- (C) Repulsion start induction run motor
- (D) None of the above

ANS: C

8. Which of the following motors is preferred for tape-recorders?

- (A) Shaded pole motor
- (B) Hysteresis motor
- (C) Two value capacitor motor
- (D) Universal motor

ANS: B

9. Which of the following single-phase induction motors is generally used in time phonographs?

- (A) Resistance start
- (B) Capacitor start capacitor run
- (C) Shaded pole
- (D) Universal

ANS: C

10. The direction of rotation of universal motor can be reversed the by reversing the flow of current through

- (A) Armature winding
- (B) Field winding
- (C) Either armature winding or field winding
- (D) None of the above

ANS: C

11.The spring material used in a spring control device should have the following property.

- (A) Should be nonmagnetic
- (B) Most be of low temperature coefficient
- (C) Should have low specific resistance
- (D) All of the above

ANS: D

12. For handling greater currents induction watt-meters are used in conjunction with

(A) Potential transformers

(B) Current transformers

(C) Power transformers

(D) Either of the above

ANS: B

13. The chemical effect of current is used in

(A) D.C. ammeter hour meter

(B) D.C. ammeter

(C) D.C. energy meter

(D) None of the above

ANS: A

14. The multiplier and the meter coil in a voltmeter are in

(A) Series

(B) Parallel

(C) Series-parallel

(D) None of the above

ANS: A

15. The pressure coil of a wattmeter should be connected on the supply side of the current coil when

(A) Load impedance is high

(B) Load impedance is low

(C) Supply voltage is low

(D) None of the above

ANS: A

16. When a capacitor was connected to the terminal of ohmmeter, the pointer indicated a low resistance initially and then slowly came to infinity position. This shows that capacitor is

(A) Short-circuited

(B) All right

(C) Faulty

(D) None of the above

ANS: B

17. Which of the following devices should be used for accurate measurement of low D.C. voltage?

- (A) Small range moving coil voltmeter
- (B) D.C. potentiometer
- (C) Small range thermocouple voltmeter
- (D) None of the above

ANS: B

18. To measure an A. C. voltage by using an A.C. potentiometer, it is desirable that the supply for the potentiometer in taken

- (A) From a source which is not the same as the unknown voltage
- (B) From a battery
- (C) From the same source as the unknown voltage
- (D) Any of the above

ANS: C

19. Wagner earthing device is used to eliminate errors due to

- (A) Electrostatic coupling
- (B) Electromagnetic coupling
- (C) Both (A) and (B)
- (D) None of the above

ANS: A

20. The two pressure coils of a single phase power factor meter have

- (A) The same dimensions and the same number of turns
- (B) The same dimension but different number of turns
- (C) The same number of turns but different dimensions
- (D) None of the above

ANS: A

PROGRAMME: B.Tech ECE AC:YEAR: **2018-2019**	DEGREE: **B.TECH II YEAR**
COURSE: **SIGNALS AND STOCHASTIC PROCESS**	SEMESTER: **I** CREDITS: 3 COURSE COORDINATOR: Ms.N.SAI SRUTHI
COURSE CODE: EC304ES REGULATION:**R16**	COURSE TYPE: Core
COURSE AREA/DOMAIN: ECE	CONTACT HOURS: 4 hours/Week.
CORRESPONDING LAB COURSE CODE : EC307ES	LAB COURSE NAME: Basic Simulation lab

2.1 COURSE OVERVIEW:

This gives the basics of Signals and Systems required for all Electrical Engineering related courses. This gives concepts of Signals and Systems and its analysis using different transform techniques. This gives basic understanding of random process which is essential for random signals and systems encountered in Communications and Signal Processing areas.

2.2 PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
MA101BS	MATHEMATICS - I	Linear system of equations and Eigen values, Eigen vectors	1-1
MA102BS/MA202BS	MATHEMATICS - II	Laplace transform	1-2
MA203BS	MATHEMATICS - III	Random variables and distribution, Sampling theory	1-2

2.3 MARKS DISTRIBUTION:

Session Marks	University End Exam Marks	Total Marks
Mid Semester Test • There shall be two midterm examinations. • Each midterm examination consists of subjective type and objective type tests. • The subjective test is for 10 marks of 60 minutes duration. • Subjective test of shall contain 4 questions; the student has to answer 2 questions, each carrying 5 marks.	75	100

• The objective type test is for 10 marks of 20 minutes duration. It consists of 10 multiple choice and 10 objective type questions, the student has to answer all the questions and each carries half mark. • First midterm examination shall be conducted for the first two and half units of syllabus and second midterm examination shall be conducted for the remaining portion. **Assignment** • Five marks are earmarked for assignments. • There shall be two assignments in every theory course. Marks shall be awarded considering the average of two assignments in each course.		

2.4 EVALUATION SCHEME:

S. No	Component	Duration	Marks
1	I Mid Examination	80minutes	20
2	I Assignment	-	5
3	II Mid Examination	80minutes	20
4	II Assignment	-	5
5	External Examination	3 hours	75

2.5 COURSE OBJECTIVES & OUTCOMES:

Course Objectives	Course Outcomes	Blooms Level
Understand the basics of Signals and Systems which required for all Electrical Engineering related courses.	Represent any arbitrary analog or Digital time domain signal in frequency domain.	BL1,2
Understand concepts of Signals and Systems and its analysis using different transform techniques	Understand the importance of sampling, sampling theorem and its effects.	BL 1,2,3,4
Basic understanding of Z transforms and Laplace transforms	Understand the characteristics of linear time invariant systems	BL 1,2,3
Basic understanding of random process which is essential for random signals and systems encountered in Communications and Signal Processing areas	Determine the conditions for distortion less transmission through a system.	BL 1,2,5
Basic Understanding of the response of linear	Understand the concepts of	BL 3,5,6

time Invariant system for a Random Processes.	Random Process and its Characteristics. firmware design approaches	

BLOOMS LEVEL (BL)

BL 1: Remember / knowledge BL2: Understanding BL3: Apply

BL 4: Analyze BL 5: Evaluate BL 6: Create

HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes		Level	Proficiency assessed by	Blooms Level
A	An ability to apply knowledge of mathematics, science and engineering	H	Solving Gate and Text book Problems	APPLY
B	An ability to design and conduct experiments, as well as to analyze and interpret data	H	Solving Gate and Text book Problems	APPLY
C	An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.	S	Assignment and Gate questions	Apply and Analyze
D	An ability to identify, formulate and solve engineering problems.	H	Solving Gate and Text book Problems	Apply
E	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	H	Mini and Micro Projects	Apply
F	An ability to understand the special duty they owe to protect the public's health, safety and welfare by virtue of their professional status as engineers in society.	N	--	--
G	An ability to understand and correctly interpret the impact of engineering solutions in global, societal and environmental contexts and demonstrate the knowledge of a need for sustainable development.	S	Mini / Micro Projects and GATE questions	Analyze and Justify
H	An understanding of professional and ethical responsibility.	N	--	--

I	An ability to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	S	Class Test & Seminar	Analyze
J	An ability to 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, give and receive clear instructions.	S	Seminars	Understand & Analyze
K	An ability to demonstrate knowledge and understanding of the engineering finance and management principles as a member and leader in a team to manage projects in multi-disciplinary environments.	S	Mini and Micro Projects	Apply
L	Recognition of the need for, and an ability to engage in life-long analyzing.	S	Group Activity	Analyze
M	An ability to design and implement projects in the areas including Signal Processing, Microwaves, Communication Systems, IC Technology and Embedded Systems.	H	Mini and Micro Projects	Apply
N	An ability to use knowledge in various domains to identify research gaps and hence to provide solution to new ideas and innovations.	S	Seminars & Projects	Analyze & Apply

N = None S = Supportive H = Highly Related

2.6 SYLLABUS:

UNIT - I :

Signal Analysis: Analogy between Vectors and Signals, Orthogonal Signal Space, Signal approximation using Orthogonal functions, Mean Square Error, Closed or complete set of Orthogonal functions, Orthogonality in Complex functions, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function. Signal Transmission through Linear Systems: Linear System, Impulse response, Response of a Linear System, Linear Time Invariant (LTI) System, Linear Time Variant (LTV) System, Transfer function of a LTI system, Filter characteristics of Linear Systems, Distortion less transmission through a system, Signal bandwidth, System bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between Bandwidth and Rise time. Concept of convolution in Time domain and Frequency domain, Graphical representation of Convolution, Convolution property of Fourier Transforms

UNIT – II :

Fourier series, Transforms, and Sampling: Fourier series: Representation of Fourier series, Continuous time periodic signals, Properties of Fourier Series, Dirichlet's conditions,

Trigonometric Fourier Series and Exponential Fourier Series, Complex Fourier spectrum. Fourier Transforms: Deriving Fourier Transform from Fourier series, Fourier Transform of arbitrary signal, Fourier Transform of standard signals, Fourier Transform of Periodic Signals, Properties of Fourier Transform, Fourier Transforms involving Impulse function and Signum function. Sampling: Sampling theorem – Graphical and analytical proof for Band Limited Signals, Reconstruction of signal from its samples, Effect of under sampling – Aliasing.

UNIT – III:

Laplace Transforms and Z–Transforms: Laplace Transforms: Review of Laplace Transforms (L.T), Partial fraction expansion, Inverse Laplace Transform, Concept of Region of Convergence (ROC) for Laplace Transforms, Constraints on ROC for various classes of signals, Properties of L.T, Relation between L.T and F.T of a signal, Laplace Transform of certain signals using waveform synthesis. Z–Transforms: Fundamental difference between Continuous and Discrete time signals, Discrete time signal representation using Complex exponential and Sinusoidal components, Periodicity of Discrete time signal using complex exponential signal, Concept of ZTransform of a Discrete Sequence, Distinction between Laplace, Fourier and Z Transforms, Region of Convergence in Z-Transform, Constraints on ROC for various classes of signals, Inverse Z-transform, Properties of Z-transforms.

UNIT – IV :

Random Processes – Temporal Characteristics: The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second-Order and Wide-Sense Stationarity, (N-Order) and StrictSense Stationarity, Time Averages and Ergodicity, Autocorrelation Function and Its Properties, Cross-Correlation Function and Its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process. Random Signal, Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output.

UNIT- V:

2.7 COURSE PLAN:

S.no	Unit no	Topic	Week	No of sessions planed	Mode of teaching BB/PPT/OHP/MM	Reference	Remarks
1	**I**	**Signal Analysis:** Analogy between Vectors and Signals, Orthogonal		2	BB	A1,A4	

		Signal Space					
2		Mean Square Error, Closed or complete set ofOrthogonal functions, Orthogonality in Complex functions		1	BB	A1,A4	
3		Exponential and Sinusoidalsignals, Concepts of Impulse function, Unit Step function, Signum function		2	BB	A1,A4	
4		**Signal Transmission through Linear Systems:** Linear System, Impulse response, Responseof a Linear System, Linear Time Invariant (LTI) System.		2	BB	A1,A4	
5		Linear Time Variant (LTV) System, Transfer function of a LTI system, Filter characteristics of Linear Systems.		2	BB	A1,A4	
6		Distortion lesstransmission		2	BB	A1,A4	

		through a system, Signal bandwidth, System bandwidth, Ideal LPF, HPF and BPF characteristics.					
7		Causality and Paley-Wiener criterion for physical realization,Relationship between Bandwidth and Rise time		2	BB	A1,A4	
8		Concept of convolution in Time domain and Frequency domain.		1	BB	A1,A4	
9		Graphical representation of Convolution, Convolution property of FourierTransforms.		1	BB	A1,A4	
10	**II**	**Fourier series, Transforms, and Sampling: Four**ier series: Representation of Fourierseries, Continuous time periodic signals.		2	BB	A1,A4	
11		Properties of Fourier Series,		1	BB	A1,A4	

		Dirichlet's conditions					
12		Trigonometric Fourier Series and Exponential Fourier Series, Complex Fourier spectrum.		2	BB	A1,A4	
15		**Fourier Transforms:** Deriving Fourier Transform from Fourier series, Fourier Transform ofarbitrary signal.		2	BB	A1,A4	
16		Fourier Transform of standard signals, Fourier Transform of Periodic Signals.		2	BB	A1,A4	
17		Properties of Fourier Transform, Fourier Transforms involving Impulse function and Signum function.		2	BB	A1,A4	
18		**Sampling:** Sampling theorem – Graphical and analytical proof for Band Limited Signals.		2	BB	A1,A4	

21		Reconstruction of signal from its samples, Effect of under sampling – Aliasing.		2	BB	A1,A4	
22	**III**	**Laplace Transforms and Z–Transforms: Laplace Transforms:** Review of Laplace Transforms (L.T), Partial fraction expansion, Inverse Laplace Transform.		2	BB	A1,A4	
23		Concept of Regionof Convergence (ROC) for Laplace Transforms, Constraints on ROC for various classes of signals.		1	BB	A1,A4	
24		Properties of L.T, Relation between L.T and F.T of a signal.		1`	BB	A1,A4	
25		Laplace Transform of certain signals using waveform synthesis.		2	BB	A1,A4	
27		**Z–Transforms:** Fundamental		1	BB	A1,A4	

		difference between Continuous and Discrete time signals.					
28		Discrete time signal representation using Complex exponential and Sinusoidal components, Periodicity of Discrete time signal using complex exponential signal,		2	BB	A1,A4	
29		Periodicity of Discrete time signal using complex exponential signal, Concept of ZTransformof a Discrete Sequence.		2	BB	A1,A4	
30		Distinction between Laplace, Fourier and Z Transforms,Region of Convergence in Z-Transform.		2	BB	A1,A4	
31		Constraints on ROC for various classes of signals,Inverse Z-transform,		2	BB	A1,A4	

		Properties of Z-transforms.					
32	**IV**	**Random Processes – Temporal Characteristics:** The Random Process Concept,Classification of Processes.		2	BB	A3	
33		Deterministic and Nondeterministic Processes, Distribution andDensity Functions, concept of Stationarity and Statistical Independence.		2	BB	A3	
34		First-Order Stationary Processes, Second- Order and Wide-Sense Stationary, (N-Order) and Strict-Sense Stationarity, Time Averages and Ergodicity.		2	BB	A3	
35		Autocorrelation Function and Its Properties, Cross-Correlation Function and Its		1	BB	A3	

		Properties.					
36		Covariance Functions, Gaussian Random Processes, Poisson Random Process. Random Signal.		1	BB	A3	
37		Mean and Mean-squaredValue of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output.		2	BB	A3	
39	**V**	**Random Processes – Spectral Characteristics:** The Power Spectrum: Properties.		2	BB	A3	
41		Relationship between Power Spectrum and Autocorrelation Function.		2	BB	A3	
42		The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross-		2	BB	A3	

		Correlation Function.					
43		Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output.		3	BB	A3	

Random Processes – Spectral Characteristics: The Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross Correlation Function. Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output.

TEXT BOOKS:

1. Signals, Systems & Communications - B.P. Lathi , 2013, BSP.
2. Signal and systems principles and applications, shaila dinakar Apten, Cambridge university press, 2016.
3. Probability, Random Variables & Random Signal Principles - Peyton Z. Peebles, MC GRAW HILL EDUCATION, 4th Edition, 2001

REFERENCE BOOKS:

1. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, 2 Ed.,
2. Signals and Signals – Iyer and K. Satya Prasad, Cengage Learning

2.8 MAPPING COURSE OBJECTIVES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES:

Course Objective	Course Outcomes				
	a	b	c	d	e
I	S				
II	S	S			
III			H		
IV				H	S
V					S

S= Supportive H= Highly Related

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES:

Course Outcomes	Program Outcomes													
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**m**	**n**
a	S													
b	S	S									S		S	S
c	S	S												
d		S					S				S		H	S
e	S		S		S		S				S		S	

S= Supportive H= Highly Related

2.9 QUESTION BANK:

UNIT-I		
SIGNAL ANALYSIS		
Group – A (Short Answer Questions)		
S.No	**Question**	**Blooms Taxonomy Level**
1.	Define Signal.	Understand
2.	Define system.	Understand
3.	What are the major classifications of the signal?	Understand
4.	Define discrete time signals and classify them	Understand
5.	Define continuous time signals and classify them.	Understand
6.	Condition for minimum mean square error?	Remember
7.	Define discrete time unit step &unit impulse.	Remember
8.	Define continuous time unit step and unit impulse.	Remember
9.	Define periodic signal and nonperiodic signal.	Apply
10.	Define unit ramp signal.	Understand

11.	Define energy and power signals?	Apply
12.	Define even and odd signal?	Apply
13.	Define unit ramp function?	Apply
14.	Define the Parseval's Theorem?	Understand
15.	Define continuous time complex exponential signal?	Understand
16.	What is continuous time real exponential signal?	Understand
17.	What is continuous time growing exponential signal?	Understand
18.	Find whether the signal given by x (n) = 5cos (6n) is periodic	Apply
19.	define signum function	Remember
20.	define system bandwidth and signal bandwidth	Understand
21.	Write the differences between the continuous-time signal e^{jwot} and the discrete-time signal e^{jw0n}	Apply
Group - B (Long Answer Questions)		
1.	Define orthogonal signal space and orthogonal vector space. Bring out clearly its applications in representing a signal and vector respectively.	Remember
2.	Explain the analogy of vectors and signals in terms of orthogonality and evaluation of constant.	Understand
3.	Explain how functions can be approximated using orthogonal functions.	Evaluate
4.	Derive the relationship between rise time and bandwidth.	Understand
5.	State and Prove the Convolution property of Fourier transform	Remember
Group - C (Problem solving &Analytical Questions)		
1.	Prove that the functions Øm(t) and Øn(t) where Øk(t) =(1/√T)(cos kwt+sinkwt);T=2π/w are orthogonal over the period(0,T)	Remember

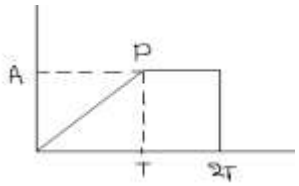
2.	Prove that sin nwt and cos mwt are orthogonal to each other for all integers m,n	Analyze
3.	Prove that the complex exponential signals are orthogonal functions $x(t)=e^{jnwt}$ and $y(t)=e^{jmwt}$ let the interval be(t0, t0+T)	Analyze
4.	A rectangular function is defined as $f(t)=\begin{cases} A, & 0<t<\pi/2 \\ -A, & \frac{\pi}{2}<t<3\pi/2 \\ A, & \frac{3\pi}{2}<t<2\pi \end{cases}$ Approximate the above function by A cos t between the intervals (0,2π) such that the mean square error is minimum.	Analyze
5.	A rectangular function is defined as $f(t)=\begin{cases} 1, & 0<t<\pi \\ -1, & \pi<t<2\pi \end{cases}$ Approximate the above function by a single sinusoid sint between the intervals(0,2π) , Apply the mean square error in this approximation.	Analyze
6.	Show that f(t) is orthogonal to signals cost, cos2t, cos3t, … cosnt for all integer values of n, n≠0, over the interval (0,2π) if $f(t)=\begin{cases} 1, & 0<t<\pi \\ -1, & \pi<t<2\pi \end{cases}$	Analyze
7.	Consider the complex valued exponential signal $x(t)= A e^{\alpha t+jwt}$, a>0. Apply the real and imaginary components of x(t) for the following case i) α is real, α=α1 ii) α is imaginary, α=jw iii) α is complex, α=α+jw	Analyze

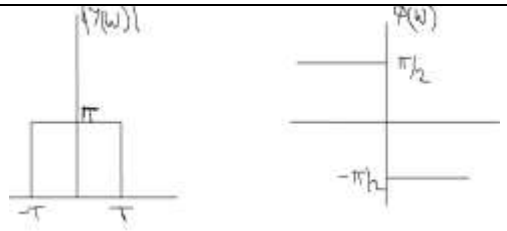
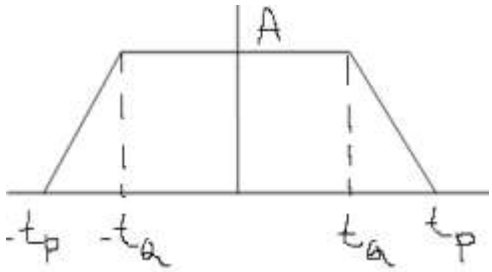
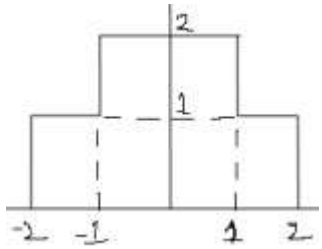
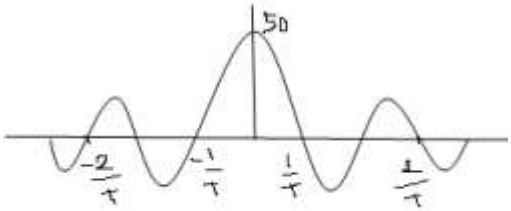
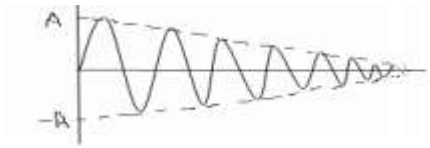
8.	Sketch the following signals i) $\pi\left(\frac{t-1}{2}\right) + \pi(t-1)$ ii) f(t)=3u(t)+tu(t)-(t-1)u(t-1)-5u(t-2) Determine whether each of the following sequences are periodic or not, if periodic determine the fundamental period. i) x(n)= sin(6πn/7) ii) y(n)= sin(n/8)	Analyze
9.	Find the impulse response of a system characterized by the differential equations a) $\tau\left[\frac{dy(t)}{dt} + y(t) = x(t); \quad -\infty < t < \infty\right.$ b) $\tau\left[\frac{d^2y(t)}{dt^2} + y(t) = x(t); \quad -\infty < t < \infty\right.$ Where x(t) is the input and y(t) is the output	Analyze
10.	The impulse response of a continuous time system is expressed as $h(t) = \frac{1}{RC}e^{-\frac{t}{RC}}u(t)$ find the frequency response and plot the magnitude and phase plots	Analyze
11.	The impulse response of a continuous time system is expressed as $h(t) = \frac{1}{RC}e^{-\frac{t}{RC}}u(t)$ find the frequency response and plot the magnitude and phase plots	Analyze
12.	A system produces an output of $y(t)= e^{-t}u(t)$ for an input of $x(t)= e^{-2t}u(t)$. Determine the impulse response and frequency response of the system	Analyze

13.	Consider a causal LTI system with frequency response $H(w) = \frac{1}{3+jw}$ For a particular input x(t), the system is observed to produce the output, y(t)=e-3t u(t) - e-4tu(t), find the input x(t)?	Analyze
14.	Determine the convolution of two functions x(t)=a e^{-at} ; y(t)= u(t)	Analyze
15.	Determine the energy and power for the following signals and hence determine whether the signal id energy or power signal i) x(t)=e-3t ii) x(t)=e-3|t| iii) x(t)= e-10t u(t) iv) x(t)=A ej2πat	Analyze
16.	Verify Parseval's theorem for the energy signal x(t)= e-at u(t), a>0	Analyze
17.	Find the power for the following signals i) A cos wt ii) a+f(t), a is a constant and f(t) is a power signal with zero mean	Analyze
UNIT-II		
FOURIER SERIES, TRANSFORMS, AND SAMPLING		
Group – A (Short Answer Questions)		
1.	Define Fourier transform pair.	Understand
2.	Find the Fourier transform of x(t)=sin(wt)	Evaluate
3.	Explain how periodic signals can be represented by Fourier transform.	Understand
4.	Explain how periodic signals can be represented by Fourier transform.	Understand
5.	State Convolution property of Fourier Transform.	Evaluate

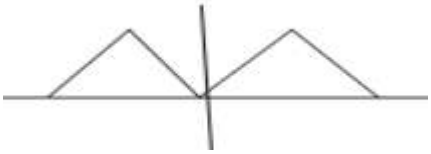
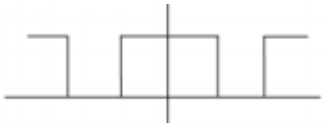
6.	Find the Fourier transform of x(t)=cos(wt)	Evaluate
7.	Find the Fourier transform of sgn function Find the Fourier transform of x(t)=ej2πft	Understand
9.	State Parseval's relation for continuous time fourier transforms.	Understand
10.	State properties of fourier transform.	Understand
11.	The Fourier transform (FT) of a function x (t) is X (w). What is the FT of dx(t)/ dt	Evaluate
12.	What is the Fourier transform of a rectangular pulse existing between t = − T / 2 to t = T / 2	Evaluate
13.	What is the Fourier transform of a signal x(t) =e2t u(-t) What are the difference between Fourier series and Fourier transform?	Evaluate
14.	Explain time shifting property of fourier transform	Understand
15.	Why CT signals are represented by samples.	Understand
16.	What is meant by sampling?	Understand
17.	State Sampling theorem.	Understand
18.	What is meant by aliasing?	Understand
19.	What are the effects aliasing?	Understand
20.	What are all the blocks are used to represent the CT signals by its samples?	Understand
21.	Mention the types of sampling.	Understand
22.	Define Nyquist's rate.	Understand
23.	What is the condition for avoid the aliasing effect?	Remember
24.	What is an antialiasing filter?	Understand

25.	What is the Nyquist's Frequency for the signal x(t) =3 cos 50t +10 sin 300t – cos100t ?	Evaluate
26.	What is the period of the signal x(t) = 10sin 12t + 4 cos18t	Evaluate
27.	Define Nyquist's interval Remember 6 29 Define sampling of band pass signals.	Understand
	What is the Nyquist's Frequency for the signal x(t) =3 cos 100t +10 sin 30t – cos50t ?	Evaluate
29.	Write down the exponential form of the Fourier series representation of a Periodic signal?	Understand
30.	Write short notes on Dirichlet's conditions for fourier series.	Understand
31.	State Time Shifting property in relation to fourier series.	Understand
32.	Obtain Fourier Series Coefficients for $x(n)=\sin(w_0 n)$.	Understand
33.	What are the types of Fourier series?	Understand
34.	Determine the complex exponential Fourier series representation for $x(t) = \cos(2t + \pi/4)$.	Evaluate
35.	Find the Fourier transform of $x(t) = e^{jwt.}$	Evaluate
	Group – B (Long Answer Questions)	
1.	Distinguish between the exponential form of the fourier series and fourier transform. What is the nature of the 'transform pair' in the above two cases.	Evaluate
2.	Find the fourier transforms of a normalized Gaussian pulse	Understand
3.	Find the fourier transforms of a Triangular pulse	Understand
4.	a)Find the Fourier transform of symmetrical gate pulse and sketch the spectrum. b) State and prove sampling theorem for band limited signals using analytical approach	Remember

5.	Write and prove any 4 properties of fourier series and transforms	Understand
Group - C (Problem solving &Analytical Questions)		
1.	Find the fourier transform of the following a) real exponential, $x(t)= e^{-at} u(t)$, $a>0$ b) rectangular pulse, $x(t)= 1, -T \leq t \leq T$ $0, \lvert t\rvert > T$ c) $x(t)= e^{at} u(-t)$, $a>0$	Apply
2.	a) Find the fourier transform of a gate function $x(t) =1, \lvert t\rvert < 1/2$ $0, \lvert t\rvert > 1/2$ b) Find the fourier transform of $x(t)=1$	Evaluate
3.	Find the fourier transforms of a) cos wt u(t) b) sin wt u(t) c) cos (wt+Ø) d) e^{jwt}	Apply
4.	Find the fourier transforms of signal $x(t)=e^{-A\lvert t\rvert}sgn(t)$	Apply
5.	Find the fourier transforms of signal x(t) 	Evaluate
6.	The magnitude $\lvert Y(w)\rvert$ and phase Ø(w) of the fourier transform of a signal y(t) are shown in below, find y(t)	Analyze

		
7.	Find the fourier transforms of the trapezoidal pulse as shown 	Analyze
8.	Find the fourier transforms of signal x(t) as shown below 	Evaluate
9.	Determine the fourier transforms of the sinc function as shown below 	Evaluate
10.	Find the fourier transform of square wave with period T=4, amplitude of 'A'	Evaluate
11.	Determine the fourier transform of exponentially damped sinusoidal signal 	Evaluate

12.	Find the fourier transform of periodic pulse train with period T=T/2, with amplitude of 'A'	Evaluate
13.	Find the fourier transform of e^{-at} sin wt u(t)	Evaluate
14.	Find the continuous magnitude and phase spectra of a single pulse $x(t) = \begin{matrix} A, & (-a,0) \\ 0, & \forall\, t \\ -A, & (0,a) \end{matrix}$	Evaluate
15.	Consider the signal x(t)=sin 50πt/πt which is to be sampled with a sampling frequency of ωs=150π to obtain a signal g(t) with fourier transform G(jw). Determine the maximum value of w0 for which it is guaranteed that G(jw)=75X(jw) for |w|≤w0, where X(jw) is F.T of x(t)	Evaluate
16.	A signal x(t)=2cos 400πt+6 cos 640πt is ideally sampled at fs=500Hz, if the sampled signal is passed through an ideal LPF with a cut off requency of 400Hz, what frequency components will appear in the output.	Evaluate
17.	Determine the Nyquist's rate and interval corresponding to each of the following signals i) x(t) =sin 4000πt/πt ii) x(t) =1+cos 2000πt+sin 4000πt	Evaluate
18.	Expand following function f(t) by trigonometric Fourier series over the interval (0,1). In this interval f(t) is expressed as f(t) = At b) State and prove multiplication property of continuous time Fourier series	Evaluate

19.	Determine the fourier series of the function shown below for the interval (0,T) with amplitude of 'A' 	Evaluate
20.	Obtain the fourier series representation of an impulse train given by $x(t) = \sum_{n=-\alpha}^{\alpha} \delta(t - nT)$	Evaluate
21.	Determine the fourier series expansion of the square wave function as $f(t) = \begin{matrix} 1, & -1/2 < t < 1/2 \\ -1, & ½ < t < 3/2 \end{matrix}$	Evaluate
22.	Obtain the trigonometric fourier series for the periodic rectangular waveform as shown below for the interval (-T/4,T/4)  The complex exponential representation of a signal x(t) over the interval (0,T) is $x(t) = \sum_{n=-\infty}^{\infty} \frac{3}{4 + (n\pi)^2} e^{jn\pi t}$ i) what is the numerical value of T? ii) if one of the components of x(t) is A cos 3πt, determine the value of A iii) determine the minimum number of terms which must me retained in the representation of x(t) in order to include 99.9% of the energy in the interval	Evaluate

UNIT-III		
LAPLACE TRANSFORMS AND Z–TRANSFORMS: LAPLACE TRANSFORMS		
Group - A (Short Answer Questions)		
1	What is the use of Laplace transform?	Remember
2	What are the types of laplace transform?	Remember
3	Define Bilateral and unilateral laplace transform. .Define inverse laplace transform.	Understand
4	State the linearity property for laplace transform.	Understand
5	Region of convergence of the laplace transform	Analyze
6	State the time shifting property for laplace transform	Analyze
7	What is pole zero plot.	Understand
8	State initial value theorem and final value theorem for laplace transform	Understand
9	State Convolution property of the Laplace transform	Understand
10	What is region of Convergence?	Understand
11.	What are the Properties of ROC?	Understand
12.	The unilateral Laplace transform of f (t) is 1/s2 +s+1. What is the unilateral Laplace transform of tf (t)	Analyze
13.	Find the Laplace Transforms of the function f(t)u(t),where f(t) is periodic with period T, is A(s) times the L.T. of its first period. In what range should Re(s) remain so that the L.T. of the function e(a+2)t+5 exists?	Evaluate
14.	Define Z transform.	Remember
15.	What are the two types of Z transform?	Understand
16.	Define unilateral Z transform.	Understand
17.	What is the time shifting property of Z transform.	Understand
18.	What is the differentiation property in Z domain	Understand

19.	State convolution property of Z transform.	Understand
20.	State the methods to find inverse Z transform.	Understand
21.	State multiplication property in relation to Z transform.	Understand
22.	State parseval's relation for Z transform.	Understand
23.	What is the relationship between Z transform and fourier	Understand
24.	Define one sided Z transform and two sided Z transform.	Understand
25.	What is the Z-transform of sequence x(n)=an u(n)?	Analyze
26.	What is the linearity property of Z transform	Understand
27.	What is the correlation property of z transform	Understand
28	The final value of x(t)=(2+e-3t) u(t) is obviously x(∞)=2. Show that this final value can be found with the final value theorem.	Evaluate
29.	Find the Laplace transform of x (t) = $-e^{at}u(-t)$.	Evaluate
Group - B (Long Answer Questions)		
1	State the properties of Laplace transform	Understand
2	Properties of ROC of Laplace transforms	Analyze
3	Find the Laplace Transform of cos wt and sin wt using frequency shifting Properties of Z-transforms?	Analyze
Group – C (Problem solving &Analytical Questions)		
1	Determine the function of time x(t) for each of the following Laplace transforms and their associated region of convergence a) $(s+1)^2/s^2-s+1$ Re{s} > 1/2 b) $s^2-s+1/(s+1)^2$ Re{s} > -1	Apply

2	Consider the following signals, find Laplace transform and region of convergence for each signal a) e-2t u(t) + e-3t u(t) b) e-4t u(t) + e-5t sin 5t u(t	Apply
3.	Determine the function of time x(t) for each of the following Laplace transforms a) $1/ s^2+9$; Re{s}>0 b) s/s^2+9 Re{s}<0 c) $(s+1)/(s+1)^2+9$ Re{s}<-1	Analyze
4.	Determine the Laplace transform and associated region of convergence for each of the following functions of time i) $x(t) = 1; 0 \leq t \leq 1$ ii) $x(t)= \cos wt$	Evaluate
5.	Find the Laplace Transforms of the following functions a) exponential function b) unit step function c) hyperbolic sine & cosine d) damped sine function e) damped hyperbolic cosine & sine f) power 'n'	Apply
6.	Find the inverse Laplace transform of $X(s) =5s+13/s(s^2+4s+13)$, Re s > 0.	Evaluate
7.	a) Find X(z) and sketch the zero-pole plot and the ROC for a < 1 and a > 1 for the signal $x[n] = a^{\|n\|}$ b) Determine the inverse Z transform of $X z = \log(1/1-az^{-1})$; ROC| z| > a .	Evaluate

8.	Find the inverse Laplace transform of the functions i) $Y(s)= 10s/(s+2)^2(s+8)$ ii) $Y(s)= 10s/(s+2)^3(s+8)$	Evaluate
9.	Find the inverse Laplace transform of the functions i) $Y(s)=(2s^2+6s+6) /(s+2) (s^2+2s+2)$ ii) $Y(s)=(s^4+5s^3+12s^2+7s+15) /(s+2) (s^2+1)^2$	Evaluate
10.	Determine the Laplace transform and associated region of convergence and pole-zero plot for the following function of time. x(t)= e-2t u(t) + e3t u(t)	Evaluate
11.	Find the z-transform of the following sequences i) $x[n]= a^{-n}u[-n-1]$ ii) x[n]= u[-n] iii) $x[n]= -a^nu[-n-1]$	Evaluate
12.	A finite series sequence x[n] is defined as x[n]={5,3,-2,0,4,-3}.find X[z] and its ROC.	Evaluate
13.	Find the z-transform of the following i) x[n]= cos nw. u[n] ii) $x[n]= a^n$sin nw. u[n] iii) x[n]= anu [n]	Evaluate

UNIT-IV

RANDOM PROCESSES – TEMPORAL CHARACTERISTICS

Group - A (Short Answer Questions)

1.	Define random process?	Understand
2.	Define ergodicity?	Understand
3.	Define mean ergodic process?	Understand
4.	Define correlation ergodic process?	Understand

5.	Define first order stationary process?	Understand
6.	Define second order stationary process?	Understand
7.	Define wide sense stationary random process?	Understand
8.	Define strict sense stationary random process?	Understand
9.	Define auto correlation function of a random process?	Understand
10.	Define cross correlation function of a random process?	Understand
Group – B (Long Answer Questions)		
1	Explain classification of random process	Understand
2	Explain wide sense stationary random process	Analyze
3	State and prove any four properties of cross correlation function.	Understand
4	State and prove any four properties of auto correlation function.	Apply
5	State and prove any four properties of cross covariance function.	Apply
6	a) Explain about Auto-correlation function with their properties. b) Show that mean square value of output response is independent of time t.	Evaluate
Group - C (Problem solving &Analytical Questions)		
1.	Given x=6 and Rxx(t,t+ τ)= 36+25 exp(-τ) for a random process X(t) .indicate which of the following statements are true based on what is known with certainty: X(t) i. is first order stationary ii. has total average power of 61W iii. is ergodic	Analyze
2.	(a) State and prove the properties of Autocorrelation function. (b) Show that the process X(t)= A Cos (w0t+θ) is wide sense stationery if it is assumed that A and w0 are constants and θ is uniformly distributed random variable over the interval (0,2π).	Evaluate

3.	(a) State and prove the properties of Cross correlation function. (b) Find the mean and auto correlation function of a random process X(t)=A , where A is continuous random variable with uniform distribution over (0,1).	Apply
4.	(a) Write the conditions for a Wide sense stationary random process. (b) Let two random processes X(t) and Y(t) be defined by X(t) = A Cos(w0t) + B Sin(w0t) and Y(t) = B Cos(w0t) - A Sin(w0t). Where A and B are random variables and w0 is constant. Show that X(t) and Y(t) are jointly wide sense stationery, assume A and B are uncorrelated zero- mean random variables with same variance.	Apply
5.	The power Spectral density of X(t) is given by Sxx(w)=1+w2 for w>0 Find the autocorrelation function	Apply
6.	The bus that takes you home from Chalmers arrives at the nearest bus station from early morning till late in the evening according to a renewal process with inter arrival times that are uniformly distributed between 5 and 10 minutes. You come to the bus station at 5 pm. Estimate your average waiting time for the bus to arrive.	Evaluate
7.	X(t) is a wide sense stationary random process. For each process Xi(t) defined below, determine whether Xi(t) and X(t) are jointly wide sense stationary. (a) X1(t) = X(t + a) (b) X2(t) = X(at)	Evaluate
8.	a) Explain briefly about Gaussian and Poisson Random Process. b) Show that the random process X t = Acos (ω0t + θ) is wide-sense stationary if it is assumed that A and w0 are constants and θ is a uniformly density random variable over the interval (0,2π).	Evaluate
UNIT- V		
RANDOM PROCESSES – SPECTRAL CHARACTERISTICS		
Group – A (Short Answer Questions)		
1	Define wiener khinchine relations	Understand
2	State any two properties of cross-power density spectrum.	Understand

3	Define cross –spectral density and its examples.	Apply
4	State any two uses of spectral density.	Analyze
5	Define Spectral analysis?	Understand
6	Define Spectral density?	Evaluate
7	State any two properties of an auto correlation function.	Analyze
8	Define cross correlation and its properties.	Understand
9	Prove that RXY(t) = RYX(-t)	Apply
10	State any two properties of cross correlation.	Understand
11	Find auto correlation function for SXX(ω) =8 /$(9+w^2)^2$	Understand
Group – B (Long Answer Questions)		
1	State and prove any four properties of auto covariance function.	Analyze
2	Prove wiener khinchine relations	Evaluate
3	Explain the concept of power spectral density and power spectrum	Analyze
4	Explain about cross power spectrum density and its properties with proofs.	Apply
5	Derive the relationship between cross-power spectrum and cross correlation function.	Understand
Group – C (Problem solving &Analytical Questions)		
1	A random processes X(t)= Asin(wt+θ) , where A , w are constants and θ is a uniformly distributed random variable on the interval (	Analyze
2	A random process is defined by Y(t)=X(t).cos(wt+ θ) where X(t) is a wide sense stationary random process that amplitude modulates a carrier of constant angular frequency w with a Random phase θ independent of X (t) and uniformly distributed on (	Apply
3.	(a) State and prove the properties of Autocorrelation function. (b) Show that the process X(t)= A Cos (w0t+θ) is wide sense stationery if it is assumed that A and w0 are constants and θ is uniformly distributed random variable over the interval (0	Analyze

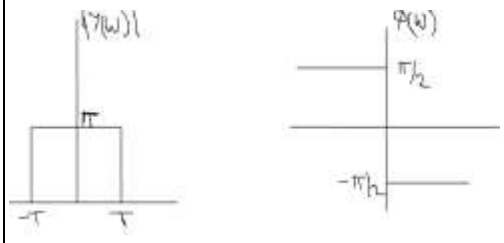
4.	Given the random process X(t)=A sin(wt+ θ) where A and w are constants and θ is a random variable uniformly distributed on the interval (-π ,π) define a new random process Y(t)= X2(t) i. Find the auto correlation function of Y(t) ii. Find the cross correlation function of X(t) and Y(t) .	Analyze
5.	Given x=6 and Rxx(t,t+ τ)= 36+25 exp(-τ) for a random process X(t) .indicate which of the following statements are true based on what is known with certainty: X(t) i. is first order stationary ii. has total average power of 61W	Analyze
6.	Two conductances G1 and G2 are at the same temperature 3000 K. Find the voltage power density spectrum at the terminals formed by the series combination of these conductance.	Analyze
7.	Let the auto correlation function of a certain random process X (t) be given by R n (τ) = A 2 /2 (cos(ωτ)) Obtain an expression for its power spectral density Sn(ω).	Analyze
8.	A wide sense stationary process X(t) has autocorrelation function R X (τ) =Ae−b|τ where b > 0. Derive the power spectral density function S X(f) and calculate the average power E[X2 (t)].	Analyze
9.	The wide sense stationary random sequence X n has zero expected value and autocorrelation function RX [k] = -σ 2 (2 − |n|)/4 n = −1, 0, 1, 0 otherwise. Derive the power spectral density function of X n	Analyze

2.10 ASSIGNMENT TOPICS:

UNIT-I SIGNAL ANALYSIS		
S. No	**Questions**	**Blooms Taxonomy Level**
1.	Define orthogonal signal space and orthogonal vector space. Bring out clearly its applications in representing a signal and vector	Remember

	respectively	
2.	Derive the relationship between rise time and bandwidth.	Understand
3.	Prove that sin nwt and cos mwt are orthogonal to each other for all integers m,n	Evaluate
4.	Explain how functions can be approximated using orthogonal functions.	Understand
5.	A rectangular function is defined as $f(t) = \begin{matrix} A, & 0 < t < \pi/2 \\ -A, & \frac{\pi}{2} < t < 3\pi/2 \\ A, & \frac{3\pi}{2} < t < 2\pi \end{matrix}$	Understand
6.	A rectangular function is defined as $f(t) = \begin{matrix} 1, & 0 < t < \pi \\ -1, & \pi < t < 2\pi \end{matrix}$ Approximate the above function by a single sinusoid sint between the intervals(0,2π) , Apply the mean square error in this approximation.	Evaluate
7.	The impulse response of a continuous time system is expressed as $h(t) = \frac{1}{RC} e^{-\frac{t}{RC}} u(t)$ find the frequency response and plot the magnitude and phase plots	Understand
8.	Consider a causal LTI system with frequency response $H(w) = \frac{1}{3+jw}$ For a particular input x(t), the system is observed to produce the output, y(t)=e-3t u(t) - e-4tu(t), find the input x(t)?	Understand
9.	determine whether the signal id energy or power signal i) x(t)=e-3t ii) x(t)=e-3|t|	

	iii) x(t)= e-10t u(t) iv) x(t)=A ej2πat	
10.	Determine the convolution of two functions x(t)=a $_e^{-at}$; y(t)= u(t)	Evaluate
	UNIT II	
	FOURIER SERIES, TRANSFORMS, AND SAMPLING	
1.	Write and prove any 4 properties of fourier series and transforms	Understand
2.	Distinguish between the exponential form of the fourier series and fourier transform. What is the nature of the 'transform pair' in the above two cases.	Evaluate
3.	Find the fourier transforms of a normalized Gaussian pulse	Evaluate
4.	Find the Fourier transforms of a Triangular pulse	Understand
5.	a)Find the Fourier transform of symmetrical gate pulse and sketch the spectrum. b) State and prove sampling theorem for band limited signals using analytical approach	Analyze
6.	Write and prove any 4 properties of fourier series and transforms	Evaluate
7.	Distinguish between the exponential form of the Fourier series and fourier transform. What is the nature of the 'transform pair' in the above two cases.	Evaluate
8.	Find the fourier transforms of a normalized Gaussian pulse	Apply
9.	a) Find the fourier transform of a gate function x(t) =1, |t| < 1/2 0, |t|> 1/2 b) Find the fourier transform of x(t)=1	Apply
10.	Find the fourier transforms of a) cos wt u(t) b) sin wt u(t) c) cos (wt+Ø) d) e^{jwt}	Apply
11.	The magnitude |Y(w)| and phase Ø(w) of the fourier transform of a signal y(t)	Evaluate

	are shown in below, find y(t) 	
12.	Determine the fourier series expansion of the square wave function as $f(t) = \begin{matrix} 1, & -1/2 < t < 1/2 \\ -1, & ½ < t < 3/2 \end{matrix}$	Evaluate
13.	Expand following function f(t) by trigonometric Fourier series over the interval (0,1). In this interval f(t) is expressed as f(t) = At b) State and prove multiplication property of continuous time Fourier series	Analyze
	UNIT- III	
	LAPLACE TRANSFORMS AND Z–TRANSFORMS: LAPLACE TRANSFORMS	
1.	State the properties of Laplace transform	Understand
2.	Properties of ROC of Laplace transforms	Analyze
3.	Find the Laplace Transform of cos wt and sin wt using frequency shifting Properties of Z-transforms?	Analyze
4.	Determine the function of time x(t) for each of the following Laplace transforms and their associated region of convergence a) $(s+1)^2/s^2-s+1$ Re{s} > 1/2 b) $s^2-s+1/(s+1)^2$ Re{s} > -1	Evaluate
5.	Find the Laplace Transforms of the following functions	Evaluate

	a) exponential function b) unit step function c) hyperbolic sine & cosine d) damped sine function e) damped hyperbolic cosine & sine f) power 'n'	
6.	a) Find X(z) and sketch the zero-pole plot and the ROC for a < 1 and a > 1 for the signal x[n] = $a^{\|n\|}$ b) Determine the inverse Z transform of X z = log(1/1−az^{-1}) ; ROC| z| > a . Find the inverse Laplace transform of the functions i) Y(s)= 10s/$(s+2)^2$(s+8) ii) Y(s)= 10s/$(s+2)^3$(s+8)	Evaluate
8.	Find the z-transform of the following sequences i) x[n]= a^{-n}u[-n-1] ii) x[n]= u[-n] iii) x[n]= -a^nu[-n-1]	Evaluate
9.	A finite series sequence x[n] is defined as x[n]={5,3,-2,0,4,-3}.find X[z] and its ROC.	Apply
	UNIT- IV	
	RANDOM PROCESSES – TEMPORAL CHARACTERISTICS	
1.	Explain wide sense stationary random process	Analyze
2.	a)State and prove any four properties of cross correlation function. b)State and prove any four properties of auto correlation function.	Understand Understand
3.	State and prove any four properties of cross covariance function.	Apply
4.	(a) Write the conditions for a Wide sense stationary random process. (b) Let two random processes X(t) and Y(t) be defined by X(t) = A Cos(w0t) + B Sin(w0t) and Y(t) = B Cos(w0t) - A Sin(w0t). Where	Evaluate

	A and B are random variables and w0 is constant. Show that X(t) and Y(t) are jointly wide sense stationery, assume A and B are uncorrelated zero- mean random variables with same variance.	
5.	Given x=6 and Rxx(t,t+ τ)= 36+25 exp(-τ) for a random process X(t) .indicate which of the following statements are true based on what is known with certainty: X(t) i. is first order stationary ii. has total average power of 61W iii. is ergodic	Evaluate
6.	The bus that takes you home from Chalmers arrives at the nearest bus station from early morning till late in the evening according to a renewal process with inter arrival times that are uniformly distributed between 5 and 10 minutes. You come to the bus station at 5 pm. Estimate your average waiting time for the bus to arrive.	Understand
7.	X(t) is a wide sense stationary random process. For each process Xi(t) defined below, determine whether Xi(t) and X(t) are jointly wide sense stationary. (a) X1(t) = X(t + a) (b) X2(t) = X(at)	Understand
8.	a) Explain briefly about Gaussian and Poisson Random Process. b) Show that the random process X t = Acos (ω0t + θ) is wide-sense stationary if it is assumed that A and w0 are constants and θ is a uniformly density random variable over the interval (0,2π).	Apply

UNIT-V

Random Processes – Spectral Characteristics

1.	State any two properties of cross-power density spectrum.	Analyze
2.	State any two properties of an auto correlation function.	Evaluate
3.	Explain about cross power spectrum density and its properties with proofs.	Apply
4.	Derive the relationship between cross-power spectrum and cross correlation function.	Understand
5.	A random process is defined by Y(t)=X(t).cos(wt+ θ) where X(t) is a wide sense stationary random process that amplitude modulates a carrier of constant angular frequency w with a Random phase θ independent of X (t) and uniformly distributed on (	Evaluate
6.	Given x=6 and Rxx(t,t+ τ)= 36+25 exp(-τ) for a random process X(t) .indicate which of the following statements are true based on what is known with certainty: X(t) i. is first order stationary ii. has total	Analyze

	average power of 61W	
7.	Two conductances G1 and G2 are at the same temperature 3000 K. Find the voltage power density spectrum at the terminals formed by the series combination of these conductance.	Understand
8.	A wide sense stationary process X(t) has autocorrelation function R X (τ) =Ae−b|τ where b > 0. Derive the power spectral density function S X(f) and calculate the average power E[X2 (t)].	Evaluate
9.	The wide sense stationary random sequence X n has zero expected value and autocorrelation function RX [k] = -σ 2 (2 − |n|)/4 n = −1, 0, 1, 0 otherwise. Derive the power spectral density function of X n	Understand

2.11 OBJECTIVE QUESTIONS:

Unit-I

1. Which property of delta function indicates the equality between the area under the product of function with shifted impulse and the value of function located at unit impulse instant?
a. Replication
b. Sampling
c. Scaling
d. Product
ANSWER: (b) Sampling

2. Which among the below specified conditions/cases of discrete time in terms of real constant 'a', represents the double-sided decaying exponential signal?
a. a > 1
b. 0 < a < 1
c. a < -1
d. -1 < a < 0
ANSWER: (d) -1 < a < 0

3) Damped sinusoids are _____
a. sinusoid signals multiplied by growing exponentials
b. sinusoid signals divided by growing exponentials
c. sinusoid signals multiplied by decaying exponentials
d. sinusoid signals divided by decaying exponentials
ANSWER: (c) sinusoid signals multiplied by decaying exponentials

4) An amplitude of sinc function that passes through zero at multiple values of an independent variable 'x' _____
a. Decreases with an increase in the magnitude of an independent variable (x)
b. Increases with an increase in the magnitude of an independent variable (x)
c. Always remains constant irrespective of variation in magnitude of 'x'
d. Cannot be defined
ANSWER: (a) Decreases with an increase in the magnitude of an independent variable (x)

5) A system is said to be shift invariant only if_____
a. a shift in the input signal also results in the corresponding shift in the output
b. a shift in the input signal does not exhibit the corresponding shift in the output
c. a shifting level does not vary in an input as well as output
d. a shifting at input does not affect the output
ANSWER: (a) a shift in the input signal also results in the corresponding shift in the output

6) Which condition determines the causality of the LTI system in terms of its impulse response?
a. Only if the value of an impulse response is zero for all negative values of time
b. Only if the value of an impulse response is unity for all negative values of time
c. Only if the value of an impulse response is infinity for all negative values of time
d. Only if the value of an impulse response is negative for all negative values of time
ANSWER: (a) Only if the value of an impulse response is zero for all negative values of time

7) Under which conditions does an initially relaxed system become unstable?
a. only if bounded input generates unbounded output
b. only if bounded input generates bounded output
c. only if unbounded input generates unbounded output
d. only if unbounded input generates bounded output
ANSWER: (a) only if bounded input generates unbounded output

8) Which among the following are the stable discrete time systems?
1. $y(n) = x(4n)$
2. $y(n) = x(-n)$
3. $y(n) = ax(n) + 8$
4. $y(n) = \cos x(n)$

a. 1 & 3
b. 2 & 4
c. 1, 3 & 4
d. 1, 2, 3 & 4
ANSWER: (d) 1, 2, 3 & 4

9) An equalizer used to compensate the distortion in the communication system by faithful recovery of an original signal is nothing but an illustration of _____

a. Static system
b. Dynamic system
c. Invertible system
d. None of the above
ANSWER: (c) Invertible system

10) Which block of the discrete time systems requires memory in order to store the previous input?
a. Adder
b. Signal Multiplier
c. Unit Delay
d. Unit Advance
ANSWER: (c)Unit Delay

11) Which type/s of discrete-time system do/does not exhibit the necessity of any feedback?
a. Recursive Systems
b. Non-recursive Systems
c. Both a & b
d. None of the above
ANSWER: (b) Non-recursive Systems

12) Which among the following belongs to the category of non-recursive systems?
a. Causal FIR Systems
b. Non-causal FIR Systems
c. Causal IIR Systems
d. Non-causal IIR Systems
ANSWER: (a) Causal FIR Systems

13) Recursive Systems are basically characterized by the dependency of its output on _____
a. Present input
b. Past input
c. Previous outputs
d. All of the above
ANSWER: (d) All of the above

14) What does the term y(-1) indicate especially in an equation that represents the behavior of the causal system?
a. initial condition of the system
b. negative initial condition of the system
c. negative feedback condition of the system
d. response of the system to its initial input
ANSWER: (a) initial condition of the system

15) Which type of system response to its input represents the zero value of its initial condition?

a. Zero state response
b. Zero input response
c. Total response
d. Natural response
ANSWER: (a) Zero state response

16) Which is/are the essential condition/s to get satisfied for a recursive system to be linear?
a. Zero state response should be linear
b. Principle of Superposition should be applicable to zero input response
c. Total Response of the system should be addition of zero state & zero input responses
d. All of the above
ANSWER: (d) All of the above

17) Which among the following operations is/are not involved /associated with the computation process of linear convolution?
a. Folding Operation
b. Shifting Operation
c. Multiplication Operation
d. Integration Operation
ANSWER: (d) Integration Operation

18) A LTI system is said to be initially relaxed system only if ____
a. Zero input produces zero output
b. Zero input produces non-zero output
c. Zero input produces an output equal to unity
d. None of the above
ANSWER:(a) Zero input produces zero output

19) What are the number of samples present in an impulse response called as?
a. string
b. array
c. length
d. element
ANSWER: (c) length

20) Which are the only waves that correspond/ support the measurement of phase angle in the line spectra?
a. Sine waves
b. Cosine waves
c. Triangular waves
d. Square waves
ANSWER: (b) Cosine waves
21) Double-sided phase & amplitude spectra _____
a. Possess an odd & even symmetry respectively
b. Possess an even & odd symmetry respectively

c. Both possess an odd symmetry
d. Both possess an even symmetry
ANSWER: (a) Possess an odd & even symmetry respectively

Unit-II

22) What does the first term 'a_0' in the below stated expression of a line spectrum indicate?
$x(t) = a_0 + a_1 \cos w_0 t + a_2 \cos 2 w_0 t + \ldots\ldots + b_1 \sin w_0 t + b_2 \sin w_0 t + \ldots..$
a. DC component
b. Fundamental component
c. Second harmonic component
d. All of the above
ANSWER: (a) DC component

23) Which kind of frequency spectrum/spectra is/are obtained from the line spectrum of a continuous signal on the basis of Polar Fourier Series Method?
a. Continuous in nature
b. Discrete in nature
c. Sampled in nature
d. All of the above
ANSWER: (b) Discrete in nature

24) Which type/s of Fourier Series allow/s to represent the negative frequencies by plotting the double-sided spectrum for the analysis of periodic signals?
a. Trigonometric Fourier Series
b. Polar Fourier Series
c. Exponential Fourier Series
d. All of the above
ANSWER: (c) Exponential Fourier Series

25) What does the signaling rate in the digital communication system imply?
a. Number of digital pulses transmitted per second
b. Number of digital pulses transmitted per minute
c. Number of digital pulses received per second
d. Number of digital pulses received per minute
ANSWER: (a)Number of digital pulses transmitted per second

26) As the signaling rate increases, _____
a. Width of each pulse increases
b. Width of each pulse decreases
c. Width of each pulse remains unaffected
d. None of the above
ANSWER: (b)Width of each pulse decreases

27) Which phenomenon occurs due to an increase in the channel bandwidth during the transmission of narrow pulses in order to avoid any intervention of signal distortion?
a. Compression in time domain
b. Expansion in time domain
c. Compression in frequency domain
d. Expansion in frequency domain
ANSWER: (d)Expansion in frequency domain

28) Why are the negative & positive phase shifts introduced for positive & negative frequencies respectively in amplitude and phase spectra?
a. To change the symmetry of the phase spectrum
b. To maintain the symmetry of the phase spectrum
c. Both a & b
d. None of the above
ANSWER: (b) To maintain the symmetry of the phase spectrum

29) Duality Theorem / Property of Fourier Transform states that _____
a. Shape of signal in time domain & shape of spectrum can be interchangeable
b. Shape of signal in frequency domain & shape of spectrum can be interchangeable
c. Shape of signal in time domain & shape of spectrum can never be interchangeable
d. Shape of signal in time domain & shape of spectrum can never be interchangeable
ANSWER: (a) Shape of signal in time domain & shape of spectrum can be interchangeable

30) Which property of fourier transform gives rise to an additional phase shift of $-2\pi f t_d$ for the generated time delay in the communication system without affecting an amplitude spectrum?
a. Time Scaling
b. Linearity
c. Time Shifting
d. Duality
ANSWER: (c) Time Shifting

31) Which among the below assertions is precise in accordance to the effect of time scaling?
A : Inverse relationship exists between the time and frequency domain representation of signal
B : A signal must be necessarily limited in time as well as frequency domains

a. A is true & B is false
b. A is false & B is true
c. Both A & B are true
d. Both A & B are false
ANSWER: (a)A is true & B is false

32) Which is/are the mandatory condition/s to get satisfied by the transfer function for the purpose of distortion-less transmission?
a. Amplitude Response should be constant for all frequencies
b. Phase should be linear with frequency passing through zero
c. Both a & b
d. None of the above

ANSWER: (c)Both a & b

33) What is/are the crucial purposes of using the Fourier Transform while analyzing any elementary signals at different frequencies?
a. Transformation from time domain to frequency domain
b. Plotting of amplitude & phase spectrum
c. Both a & b
d. None of the above
ANSWER: (c)Both a & b

34) What is the possible range of frequency spectrum for discrete time fourier series (DTFS)?
a. 0 to 2π
b. $-\pi$ to $+\pi$
c. Both a & b
d. None of the above
ANSWER: (c)Both a & b

35) Which among the following assertions represents a necessary condition for the existence of Fourier Transform of discrete time signal (DTFT)?
a. Discrete Time Signal should be absolutely summable
b. Discrete Time Signal should be absolutely multipliable
c. Discrete Time Signal should be absolutely integrable
d. Discrete Time Signal should be absolutely differentiable
ANSWER: (a)Discrete Time Signal should be absolutely summable

36) What is the nature of Fourier representation of a discrete & aperiodic signal?
a. Continuous & periodic
b. Discrete & aperiodic
c. Continuous & aperiodic
d. Discrete & periodic
ANSWER: (a) Continuous & periodic

37) Which property of periodic signal in DTFS gets completely clarified / identified by the equation $x(n - n_0)$?
a. Conjugation
b. Time Shifting
c. Frequency Shifting
d. Time Reversal
ANSWER: (b) Time Shifting

Unit-III

38) A Laplace Transform exists when _____
A. The function is piece-wise continuous
B. The function is of exponential order
C. The function is piecewise discrete
D. The function is of differential order

a. A & B
b. C & D
c. A & D
d. B & C
ANSWER: (a) A & B

39) Where is the ROC defined or specified for the signals containing causal as well as anti-causal terms?
a. Greater than the largest pole
b. Less than the smallest pole
c. Between two poles
d. Cannot be defined
ANSWER: (c) Between two poles

40) What should be the value of laplace transform for the time-domain signal equation e^{-at} cos ωt.u(t)?
a. 1 / s + a with ROC σ > – a
b. ω / $(s + a)^2 + \omega^2$ with ROC σ > – a
c. s + a / $(s + a)^2 + \omega^2$ with ROC σ > – a
d. Aω / $s^2 + \omega^2$ with ROC σ > 0
ANSWER: (c) s + a / $(s + a)^2 + \omega^2$ with ROC σ > – a

41) According to the time-shifting property of Laplace Transform, shifting the signal in time domain corresponds to the _____
a. Multiplication by e^{-st0} in the time domain
b. Multiplication by e^{-st0} in the frequency domain
c. Multiplication by e^{st0} in the time domain
d. Multiplication by e^{st0} in the frequency domain
ANSWER: (b) Multiplication by e^{-st0} in the frequency domain

42) Which result is generated/ obtained by the addition of a step to a ramp function?
a. Step Function shifted by an amount equal to ramp
b. Ramp Function shifted by an amount equal to step
c. Ramp function of zero slope
d. Step function of zero slope
ANSWER: (b) Ramp Function shifted by an amount equal to step

43) Unilateral Laplace Transform is applicable for the determination of linear constant coefficient differential equations with _____
a. Zero initial condition
b. Non-zero initial condition
c. Zero final condition
d. Non-zero final condition
ANSWER: (b) Non-zero initial condition

44) What should be location of poles corresponding to ROC for bilateral Inverse Laplace Transform especially for determining the nature of time domain signal?

a. On L.H.S of ROC
b. On R.H.S of ROC
c. On both sides of ROC
d. None of the above
ANSWER: (c) On both sides of ROC

45) Generally, the convolution process associated with the Laplace Transform in time domain results into_____
a. Simple multiplication in complex frequency domain
b. Simple division in complex frequency domain
c. Simple multiplication in complex time domain
d. Simple division in complex time domain
ANSWER: (a) Simple multiplication in complex frequency domain

46) An impulse response of the system at initially rest condition is basically a response to its input & hence also regarded as,
a. Black's function
b. Red's function
c. Green's function
d. None of the above
ANSWER: (c) Green's function

47) When is the system said to be causal as well as stable in accordance to pole/zero of ROC specified by system transfer function?
a. Only if all the poles of system transfer function lie in left-half of S-plane
b. Only if all the poles of system transfer function lie in right-half of S-plane
c. Only if all the poles of system transfer function lie at the centre of S-plane
d. None of the above
ANSWER: (a) Only if all the poles of system transfer function lie in left-half of S-plane

48) Correlogram is a graph of _____
a. Amplitude of one signal plotted against the amplitude of another signal
b. Frequency of one signal plotted against the frequency of another signal
c. Amplitude of one signal plotted against the frequency of another signal
d. Frequency of one signal plotted against the time period of another signal
ANSWER: (a) Amplitude of one signal plotted against the amplitude of another signal

49) Which theorem states that the total average power of a periodic signal is equal to the sum of average powers of the individual fourier coefficients?
a. Parseval's Theorem
b. Rayleigh's Theorem
c. Both a & b
d. None of the above
ANSWER: (a) Parseval's Theorem

50) According to Rayleigh's theorem, it becomes possible to determine the energy of a signal by_____

a. Estimating the area under the square root of its amplitude spectrum
b. Estimating the area under the square of its amplitude spectrum
c. Estimating the area under the one-fourth power of its amplitude spectrum
d. Estimating the area exactly half as that of its amplitude spectrum
ANSWER: (b) Estimating the area under the square of its amplitude spectrum

51) What does the spectral density function of any signal specify?
a. Distribution of energy or power
b. Consumption of energy or power
c. Conservation of energy or power
d. Generation of energy or power
ANSWER: (a) Distribution of energy or power

52) Which among the below mentioned transform pairs is/are formed between the auto-correlation function and the energy spectral density, in accordance to the property of Energy Spectral Density (ESD)?
a. Laplace Transform
b. Z-Transform
c. Fourier Transform
d. All of the above
ANSWER: (c) Fourier Transform

53) The ESD of a real valued energy signal is always _____
a. An even (symmetric) function of frequency
b. An odd (non-symmetric) function of frequency
c. A function that is odd and half-wave symmetric
d. None of the above
ANSWER: (a) An even (symmetric) function of frequency

54) Which among the below mentioned assertions is /are correct?
a. Greater the value of correlation function, higher is the similarity level between two signals
b. Greater the value of correlation function, lower is the similarity level between two signals
c. Lesser the value of correlation function, higher is the similarity level between two signals
d. Lesser the value of correlation function, lower is the similarity level between two signals

a. Only C
b. Only B
c. A & D
d. B & C
ANSWER: (c) A & D

UNIT-IV

55) Which function has a provision of determining the similarity between the signal and its delayed version?

a. Auto-correlation Function
b. Cross-correlation Function
c. Both a & b
d. None of the above
ANSWER: (a) Auto-correlation Function

56) Which property is exhibited by the auto-correlation function of a complex valued signal?
a. Commutative property
b. Distributive property
c. Conjugate property
d. Associative property
ANSWER: (c) Conjugate property

57) Where does the maximum value of auto-correlation function of a power signal occur?
a. At origin
b. At extremities
c. At unity
d. At infinity
ANSWER: (a) At origin

58. Random variables give relationship between _____
a) Two random events
b) Probability of occurence of two random events
c) Random event and a real number
d) Random event and its probability of occurrence

Answer: c

59. The distribution function of random variable is
a) P(X less than or equal to x)
b) P(X greater than or equal to x)
c) P(X less than x)
d) P(X greater than x)
Answer: a

60.The value of probability density function of random variable is
a) Positive function
b) Negative function
c) Zero
d) On
Answer: a
61. Random process is a function of _____
a) Random event and time
b) Random event and frequency
c) Random event and real number
d) None of the mentioned
Answer: a

62. A random process is called as stationary in strict sense if
a) Its statistics vary with shift in time origin
b) Its statistics does not vary with shift in time origin
c) Its autocorrelation vary with shift in time
d) Its autocorrelation does not vary with shift in time
Answer: a
63. White noise has _____ mean and _____ variance.
a) Zero and zero
b) Finite and zero
c) Zero and finite
d) One and zero
Answer: c

UNIT-V

64.Which theorem states that the total average power of a periodic signal is equal to the sum of average powers of the individual fourier coefficients?

a. Parseval's Theorem
b. Rayleigh's Theorem
c. Both a & b
d. None of the above
ANSWER: a. Parseval's Theorem

65.What does the spectral density function of any signal specify?

a. Distribution of energy or power
b. Consumption of energy or power
c. Conservation of energy or power
d. Generation of energy or power
ANSWER: a. Distribution of energy or power

66.Power spectrum describes distribution of _____ under frequency domain.
a) Mean
b) Variance
c) Gaussian
d) None of the mentioned
Answer: b
67. How can power spectral density of non periodic signal be calculated?
a) By integrating
b) By truncating
c) By converting to periodic
d) None of the mentioned
Answer: b
68.What is Wiener-Khinchin theorem?
a) Spectral density and auto-covariance makes a fourier transform pair
b) Spectral density and auto-correlatioon makes a fourier tranform pair
c) Spectral density and variance makes a fourier tranform pair
d) None of the mentioned
Answer: b

69.According to Parseval's theorem the energy spectral density curve is equal to?
a) Area under magnitude of the signal
b) Area under square of the magnitude of the signal
c) Area under square root of magnitude of the signal
d) None of the mentioned
Answer: b

PROGRAMME: B.Tech ECE AC.YEAR: **2018-2019**	DEGREE: **B.TECH II YEAR**
COURSE: **ANALOG ELECTRONICS**	SEMESTER: **I** CREDITS: 4 COURSE COORDINATOR: **Dr. S. M. Khaja**
COURSE CODE: **EC302ES** REGULATION:**R16**	COURSE TYPE: **Core**
COURSE AREA/DOMAIN: ECE	CONTACT HOURS: 4 hours/Week.
CORRESPONDING LAB COURSE CODE : EC408ES	LAB COURSE NAME: ANALOG ELECTRONICS LAB

3.1 COURSE OVERVIEW:

Different circuit realizations with components such as diodes, BJTs and transistors studied earlier. Various types of amplifier circuits such as small signal, cascaded, large signal and tuned amplifiers. Concept of feedback in amplifiers so as to differentiate between negative and positive feedback. Cascade different amplifier configurations to obtain the required overall specifications like Gain, Bandwidth, Input and Output interfacing Impedances.

3.2 PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
1	Electronic devices and circuits	Concepts of basic electronics	I-II
2	Network analysis	Knowledge of networks and various techniques to analyze	II-I

3.3 MARKS DISTRIBUTION:

Session Marks	University End Exam Marks	Total Marks
Mid Semester Test • There shall be two midterm examinations. • Each midterm examination consists of subjective type and objective type tests. • The subjective test is for 10 marks of 60 minutes duration. • Subjective test of shall contain 4 questions; the student has to answer 2 questions, each carrying 5 marks. • The objective type test is for 10 marks of 20 minutes duration. It consists of 10 multiple choice and 10 objective type questions, the student has to answer all the questions and each carries half mark.	75	100

• First midterm examination shall be conducted for the first two and half units of syllabus and second midterm examination shall be conducted for the remaining portion. **Assignment** • Five marks are earmarked for assignments. • There shall be two assignments in every theory course. Marks shall be awarded considering the average of two assignments in each course.		

3.4 EVALUATION SCHEME:

S. No	Component	Duration	Marks
1	I Mid Examination	80minutes	20
2	I Assignment	-	5
3	II Mid Examination	80minutes	20
4	II Assignment	-	5
5	External Examination	3 hours	75

3.5 COURSE OBJECTIVES & OUTCOMES:

Course Objectives	Course Outcomes	Blooms Level
To introduce circuit realizations with components such as diodes, BJTs and transistors studied earlier.	Design and analyze small signal amplifier circuits applying the biasing techniques learnt earlier.	BL1,2
To give understanding of various types of amplifier circuits such as small signal, Cascaded amplifiers	Cascade different amplifier configurations to obtain the required overall specifications like Gain, Bandwidth, Input and Output interfacing Impedances	BL 1,3,4
To give understanding of various types of amplifier circuits such as large signal and tuned amplifiers	Cascade different amplifier configurations to obtain the required overall specifications like Gain, Bandwidth, Input and Output interfacing Impedances	BL 1,2,5
To familiarize the Concept of feedback in amplifiers so as to differentiate between negative and positive feedback.	Design and realize different classes of Power Amplifiers and tuned amplifiers useable for audio and Radio applications.	BL 1,2,5
Oscillators functionality	Utilize the Concepts of negative feedback to improve the stability of amplifiers and positive feedback to generate sustained oscillations	BL 1,3,6

BLOOMS LEVEL (BL)

BL 1: Remember / knowledge BL2: Understanding BL3: Apply
BL 4: Analyze BL 5: Evaluate BL 6: Create

3.6 HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes		Level	Proficiency assessed by	Blooms Level
A	An ability to apply knowledge of mathematics, science and engineering	S	Solving Gate and Text book Problems	APPLY
B	An ability to design and conduct experiments, as well as to analyze and interpret data	S	Solving Gate and Text book Problems	APPLY
C	An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.	H	Assignment and Gate questions	Apply and Analyze
D	An ability to identify, formulate and solve engineering problems.	S	Class Test & Group Activity	Apply
E	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	S	Mini and Micro Projects	Apply
F	An ability to understand the special duty they owe to protect the public's health, safety and welfare by virtue of their professional status as engineers in society.	N	--	--
G	An ability to understand and correctly interpret the impact of engineering solutions in global, societal and environmental contexts and demonstrate the knowledge of a need for sustainable development.	H	Mini / Micro Projects and GATE questions	Analyze and Justify
H	An understanding of professional and ethical responsibility.	N	--	--
I	An ability to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	S	Class Test & Seminar	Analyze
J	An ability to communicate effectively on complex	S	Seminars	Understand

	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, give and receive clear instructions.			& Analyze
K	An ability to demonstrate knowledge and understanding of the engineering finance and management principles as a member and leader in a team to manage projects in multi-disciplinary environments.	S	Mini and Micro Projects	Apply
L	Recognition of the need for, and an ability to engage in life-long analyzing.	S	Group Activity	Analyze
M	An ability to design and implement projects in the areas including Signal Processing, Microwaves, Communication Systems, IC Technology and Embedded Systems.	H	Mini and Micro Projects	Apply
N	An ability to use knowledge in various domains to identify research gaps and hence to provide solution to new ideas and innovations.	S	Seminars & Projects	Analyze & Apply

N = None S = Supportive H = Highly Related

3.7 SYLLABUS:

UNIT – I

Analysis And Design of Small Signal Low Frequency BJT Amplifiers: Review of transistor biasing, Classification of Amplifiers – Distortion in amplifiers, Analysis of CE, CC and CB Amplifiers and CE Amplifier with emitter resistance, low frequency response of BJT Amplifiers, effect of coupling and bypass capacitors, Design of single stage RC coupled amplifier Different coupling schemes used in amplifiers, Analysis of Cascaded RC Coupled amplifiers, Cascode amplifier, Darlington pair,

UNIT – II

Transistor At High Frequency: The Hybrid- pi ( ) – Common Emitter transistor model CE short circuit current gain, current gain with resistive load, single stage CE transistor amplifier response, Gain-bandwidth product.

UNIT – III

FET Amplifiers: Analysis of JFET Amplifiers, Analysis of CS, CD, CG JFET Amplifiers, comparison of performance with BJT Amplifiers, Basic Concepts of MOS Amplifiers,

MOSFET – MOSFET Characteristics in Enhancement and Depletion mode – MOS Small signal model, Common source amplifier with resistive, Diode connected and Current source loads, Source follower, Common Gate Stage, Cascode and Folded Cascode Amplifier frequency response.

UNIT –III

Positive & Negative Feedback In Amplifiers: Classification of amplifiers, Concepts of feedback – Classification of feedback amplifiers – General characteristics of negative feedback amplifiers – Effect of Feedback on Amplifier characteristics – Voltage series, Voltage shunt, Current series and Current shunt Feedback configurations – Simple problems. Condition for oscillations. RC and LC type Oscillators – Frequency and amplitude stability of oscillators – Generalized analysis of LC oscillators, Quartz, Hartley, and Colpitts Oscillators – RC-phase shift and Wien-bridge oscillators.

UNIT – IV

Large Signal Amplifiers: Class A Power Amplifier, Maximum Value of Efficiency of Class – A Amplifier, Transformer Coupled Amplifier, Push Pull and Complimentary Symmetry Class B and Class AB Power Amplifiers – Principle of operation of class –C Amplifier, Transistor Power Dissipation, Heat Sinks.

Tuned Amplifiers: Introduction, Q-Factor, Small Signal Tuned Amplifiers, frequency response of tuned amplifiers

TEXT BOOKS:

1. Electronic Devices and Circuits, David A. Bell – 5th Edition, Oxford.

2. Electronic Devices and Circuits, S. Salivahanan, N. Suresh Kumar, A Vallvaraj, 5th Edition, MC GRAW HILL EDUCATION.

3. Electronics circuits and applications , Md H Rashid, Cengage 2014

REFERENCES:

1. Integrated Electronics, Jacob Millman, Christos C Halkias, McGraw Hill Education

2. Electronic Devices and Circuits theory– Robert L. Boylestead, Louis Nashelsky, 11th Edition, 2009, Pearson.

3. Electronic Devices Conventional and current version -Thomas L. Floyd 2015, person

3.8 COURSE PLAN:

Lecture Number	Unit	Topics to be Covered	Reference
L1	1	General discussion on Engineering	A1,A2,A3
L2	1	Introduction	A1,A2,A3
L3	1	Prerequisites and preparation methodology	A1,A2,A3
L4	1	Review of transistor biasing	A1,A2,A3
L5	1	Review of transistor biasing	A1,A2,A3
L6	1	Review of transistor biasing	A1,A2,A3
L7	1	Classification of Amplifiers	A1,A2,A3
L8	1	Distortion in amplifiers	A1,A2,A3
L9	1	Analysis of CE, CC, and CB Amplifiers	A1,A2,A3
L10	1	Analysis of CE, CC, and CB Amplifiers	A1,A2,A3
L11	1	Analysis of CE, CC, and CB Amplifiers	A1,A2,A3
L12	1	analysis of CE Amplifier with emitter resistance	A1,A2,A3
L13	1	low frequency response of BJT Amplifiers	A1,A2,A3
L14	1	effect of coupling and bypass capacitors	A1,A2,A3
L15	1	Design of single stage RC coupled amplifier	A1,A2,A3
L16	1	Design of single stage RC coupled amplifier	A1,A2,A3
L17	1	Different coupling schemes used in amplifiers	A1,A2,A3
L18	1	Analysis of Cascaded RC Coupled amplifiers	A1,A2,A3
L19	1	Cascode amplifier	A1,A2,A3
L20	1	Darlington pair	A1,A2,A3
L21	1	Revision and Review	A1,A2,A3

L22	2	The Hybrid- pi Common Emitter transistor model	A1,A2,A3
L23	2	CE short circuit current gain	A1,A2,A3
L24	2	current gain with resistive load	A1,A2,A3
L25	2	single stage CE transistor amplifier response	A1,A2,A3
L26	2	Gain-bandwidth product.	A1,A2,A3
L27	2	Revision and review	A1,A2,A3
L28	3	Analysis of JFET Amplifiers	A1,A2,A3
L29	3	Analysis of CS, CD, CG JFET Amplifiers	A1,A2,A3
L30	3	Analysis of CS, CD, CG JFET Amplifiers	A1,A2,A3
L31	3	comparison of performance with BJT Amplifiers	A1,A2,A3
L32	3	Basic Concepts of MOS Amplifiers	A1,A2,A3
L33	3	MOSFET Characteristics in Enhancement and Depletion mode	A1,A2,A3
L34	3	MOSFET Characteristics in Enhancement and Depletion mode	A1,A2,A3
L35	3	MOS Small signal model	A1,A2,A3
L36	3	Common source amplifier with resistive load	A1,A2,A3
L37	3	Common source amplifier with Diode connected load	A1,A2,A3
L38	3	Common source amplifier with Current source loads	A1,A2,A3
L39	3	Source follower	A1,A2,A3
L40	3	Common Gate Stage	A1,A2,A3
L41	3	Cascode and Folded Cascode Amplifier – frequency response	A1,A2,A3
L42	3	Cascode and Folded Cascode Amplifier – frequency response	A1,A2,A3
L43	3	Revision and review	A1,A2,A3

L44	4	Positive & Negative Feedback In Amplifiers: Classification of amplifiers	A1,A2,A3
L45	4	Concepts of feedback – Classification of feedback amplifiers	A1,A2,A3
L46	4	General characteristics of negative feedback amplifiers	A1,A2,A3
L47	4	Effect of Feedback on Amplifier characteristics	A1,A2,A3
L48	4	Voltage series, Voltage shunt Feedback configurations	A1,A2,A3
L49	4	Simple problems	A1,A2,A3
L50	4	Condition for oscillations	A1,A2,A3
L51	4	RC and LC type Oscillators	A1,A2,A3
L52	4	Frequency and amplitude stability of oscillators	A1,A2,A3
L53	4	Generalized analysis of LC oscillators-Quartz	A1,A2,A3
L54	4	Generalized analysis of Hartley & Colpitt's oscillators	A1,A2,A3
L55	4	RC-phase shift and Wien-bridge oscillators	A1,A2,A3
L56	4	RC-phase shift and Wien-bridge oscillators	A1,A2,A3
L57	4	Revision and review	A1,A2,A3
L58	5	Large Signal Amplifiers: Class A Power Amplifier	A1,A2,A3
L59	5	Maximum Value of Efficiency of Class – A Amplifier	A1,A2,A3
L60	5	Transformer Coupled Amplifier	A1,A2,A3
L61	5	Push Pull and Complimentary Symmetry Class B amplifiers	A1,A2,A3
L62	5	Push Pull and Complimentary Symmetry Class AB Power Amplifiers	A1,A2,A3
L63	5	Push Pull and Complimentary Symmetry Class AB Power Amplifiers	A1,A2,A3
L64	5	Principle of operation of class –C Amplifier	A1,A2,A3
L65	5	Transistor Power Dissipation, Heat sinks	A1,A2,A3

L66	5	Tuned Amplifiers: Introduction, Q-Factor	A1,A2,A3
L67	5	Small Signal Tuned Amplifiers	A1,A2,A3
L68	5	frequency response of tuned amplifiers	A1,A2,A3

3.9 MAPPING COURSE OBJECTIVES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES:

Course Objective	Course Outcomes				
	a	b	c	d	e
I	S				
II	S	S			
III			H		
IV				H	S
V					S

S= Supportive H= Highly Related

3.10 MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES:

Course Outcomes	Program Outcomes													
	a	b	c	d	e	f	g	h	i	j	k	l	m	n
a	S													
b	S	S									S		S	S
c	S	S												
d		S					S				S		H	S
e	S		S		S		S				S		S	

S= Supportive H= Highly Related

3.11 QUESTION BANK:

Unit-I		
ANALYSIS AND DESIGN OF SMALL SIGNAL LOW FREQUENCY BJT AMPLIFIERS		
Group – A (Short Answer Questions)		
S.No	**Question**	**Blooms Taxonomy Level**

1.	Define biasing	Understand
2.	Define quiescent point	Understand
3.	Define dc load line	Apply
4.	Define ac load line	Understand
5.	Define z parameters	Understand
6.	Define h parameters	Remember
7.	Define y parameters	Apply
8.	Explain cascading	Apply
9.	Explain cascoding	Apply
10.	Explain hybrid model	Understand
Group - B (Long Answer Questions)		
1.	Explain distortion in amplifiers	Remember
2.	Analyze CE amplifier	Understand
3.	Analyze CB amplifier	Evaluate
4.	Analyze CC amplifier	Understand
5.	Analyze CE amplifier with emitter resistance	Remember
6.	Derive effect of coupling capacitor	Understand
7.	Derive effect of bypass capacitor	Understand
8.	Design RC coupled amplifier	Understand
9.	Explain Different coupling schemes used in amplifiers	Evaluate
10.	Explain Cascaded RC Coupled amplifier	Evaluate
UNIT-II		
TRANSISTOR AT HIGH FREQUENCY		
Group – A (Short Answer Questions)		

1	Describe The Hybrid- pi model	Understand
2	Give Common Emitter transistor model	Understand
3	Define CE short circuit current gain	Understand
4	Define current gain with resistive load	Understand
5	Define single stage CE transistor amplifier response	Understand
6	Write beta cutoff frequency	Analyze
7	Write alpha cutoff frequency	Analyze
8	Write gamma cutoff frequency	Analyze
Group – B (Long Answer Questions)		
1	Explain The Hybrid- pi model	Evaluate
2	Which are the components used as Common Emitter transistor model	Understand
3	What is the difference between CE short circuit current gain and normal gain	Understand
4	What is current gain with resistive load	Evaluate
5	What is single stage CE transistor amplifier response	Evaluate
6	Compare alpha, beta and gamma cutoff frequencies	Understand
UNIT-III		
FET Amplifiers		
Group - A (Short Answer Questions)		
1	Define Analysis of JFET Amplifiers	Remember
2	Discuss Analysis of CS, CD, CG JFET Amplifiers	Remember
3	What comparison of performance with BJT Amplifiers	Understand
4	Write Basic Concepts of MOS Amplifiers	Understand
5	Define MOSFET Characteristics in Enhancement and Depletion mode	Analyze

6	Give Common source amplifier with resistive	Analyze
7	Write short notes Source follower	Understand
8	Discuss Common Gate Stage	Understand
9	Define Cascode and Folded Cascode Amplifier	Understand
10	Define frequency response.	Understand
Group - B (Long Answer Questions)		
1	What is Analysis of CS, CD, CG JFET Amplifiers	Understand
2	Explain comparison of performance with BJT Amplifiers	Analyze
3	Explain Basic Concepts of MOS Amplifiers	Analyze
4	Explain MOSFET Characteristics in Enhancement and Depletion mode	Evaluate
5	Explain MOS Small signal model	Evaluate
6	Explain Common source amplifier with resistive	Evaluate
7	Explain Diode connected and Current source loads	Evaluate
8	Explain Source follower	Apply
9	Explain Common Gate Stage	Apply
10	Explain Cascode and Folded Cascode Amplifier	Evaluate
UNIT-IV		
POSITIVE & NEGATIVE FEEDBACK IN AMPLIFIERS		
Group - A (Short Answer Questions)		
1	Define Classification of amplifiers	Understand
2	Define Concepts of feedback	Understand
3	Discuss General characteristics of negative feedback amplifiers	Understand
4	Define Effect of Feedback on Amplifier characteristics	Understand

5	Define Voltage series, Voltage shunt	Understand
6	Define Current series and Current shunt Feedback configurations	Understand
7	Analyze Condition for oscillations	Analyze
8	Define RC and LC type Oscillators	Understand
9	Define Generalized analysis of LC oscillators	Understand
10	Analyze RC-phase shift	Analyze
Group – B (Long Answer Questions)		
1	What Classification of feedback amplifiers	Understand
2	What Effect of Feedback on Amplifier characteristics	Analyze
3	Explain Voltage series FBA	Understand
4	Explain Voltage shunt FBA	Apply
5	Explain Current series and Current shunt Feedback configurations	Apply
6	Explain Condition for oscillations	Evaluate
7	Explain RC and LC type Oscillators	Evaluate
8	What is Generalized analysis of LC oscillators	Understand
9	What is Quartz, Hartley oscillators	Understand
10	Explain RC-phase shift and Wien-bridge oscillators	Apply
11	Explain Colpitts Oscillators	Apply
12	Explain Effect of Feedback on Amplifier characteristics	Analyze
UNIT- V		
LARGE SIGNAL AMPLIFIERS		
Group – A (Short Answer Questions)		
1	Define Class A Power Amplifier	Understand
2	Discuss Maximum Value of Efficiency of Class – A Amplifier	Understand

3	Discuss Transformer Coupled Amplifier	Apply
4	Give the Push Pull and Complimentary Symmetry Class B and Class AB Power Amplifiers	Analyze
5	Define Principle of operation of class –C Amplifier	Understand
6	Give the difference between class A and B amplifiers	Evaluate
7	Analyze Transistor Power Dissipation	Analyze
8	Define Heat Sinks	Understand
9	Discuss Introduction, Q-Factor	Apply
10	What is Small Signal Tuned Amplifiers	Understand
Group – B (Long Answer Questions)		
1	Explain Transformer Coupled Amplifier	Analyze
2	What is Maximum Value of Efficiency of Class – A Amplifier	Evaluate
3	Explain Class A Power Amplifier	Analyze
4	Explain Push Pull and Complimentary Symmetry Class B and Class AB Power Amplifiers	Apply
5	What is Principle of operation of class –C Amplifier	Understand
6	Explain Transistor Power Dissipation, Heat Sinks.	Evaluate
7	What Tuned Amplifiers	Understand
8	Explain Small Signal Tuned Amplifiers	Analyze
9	What frequency response of tuned amplifiers	Understand

MATHEMATICS - IV

4.1 SYLLABUS:

B tech. II Year I Sem.

L	T	P	C
4	1	0	4

Prerequisites: Foundation course

(No Prerequisites)**.**

COURSE OBJECTIVES:

To learn

- differentiation and integration of complex valued functions
- evaluation of integrals using Cauchy's integral formula
- Laurent's series expansion of complex functions
- evaluation of integrals using Residue theorem
- express a periodic function by Fourier series and a non-periodic function by Fourier transform
- to analyze the displacements of one dimensional wave and distribution of one dimensional heat equation

COURSE OUTCOMES:

After learning the contents of this paper the student must be able to

- analyze the complex functions with reference to their analyticity, integration using Cauchy's integral theorem
- find the Taylor's and Laurent's series expansion of complex functions
- the bilinear transformation
- express any periodic function in term of sines and cosines

- express a non-periodic function as integral representation
- analyze one dimensional wave and heat equation
- UNIT – I

Functions of a complex variable: Introduction, Continuity, Differentiability, Analyticity, properties, Cauchy, Riemann equations in Cartesian and polar coordinates**.** Harmonic and conjugate harmonic functions-Milne-Thompson method

UNIT - II

Complex integration: Line integral, Cauchy's integral theorem, Cauchy's integral formula, and Generalized Cauchy's integral formula, Power series: Taylor's series-Laurent series, Singular points, isolated singular points, pole of order m – essential singularity, Residue, Cauchy Residue theorem (Without proof).

UNIT – III

Evaluation of Integrals: Types of real integrals:

(a) Improper real integrals $\int_{-\infty}^{\infty} f(x)dx$ $\int_{c}^{c+2c} f(cosx, sinx)dx$

4.2 UNIT WISE PLANNER:

UNIT	DETAILS	HOURS
I	**UNIT – I** **Functions of a complex variable:** Introduction, Continuity, Differentiability, Analyticity, properties, Cauchy, Riemann equations in Cartesian and polar coordinates**.** Harmonic and conjugate harmonic functions-Milne-Thompson method	10
II	**UNIT - II** **Complex integration:** Line integral, Cauchy's integral theorem, Cauchy's integral formula, and Generalized Cauchy's integral formula, Power series: Taylor's series- Laurent series, Singular points, isolated singular points, pole of order m – essential singularity, Residue, Cauchy Residue theorem (Without proof).	15
III	**UNIT-III** Evaluation of integrels-Types of real integrals**:** **a)** Improperrealintegrals $\int_{-\infty}^{\infty} f(x)dx, \quad \int_{c}^{c+2\pi} f(cos\theta, sin\theta)d\theta$ Bilinear transformation-fixed point-cross ratio-properties-invariance of circles	10
IV	**UNIT – IV** **Fourier series and Transforms:** Introduction, Periodic functions, Fourier series of periodic function, Dirichlet's conditions, Even and odd functions, Change of interval, Half range sine and cosine series. Fourier integral theorem (without proof), Fourier sine and cosine integrals, sine and cosine, transforms,	13

	properties, inverse transforms, Finite Fourier transforms.	
V	**UNIT – V** **Applications of PDE:** Classification of second order partial differential equations, method of separation of variables, Solution of one dimensional wave and heat equations.	12

4.3 Lessonplan

		Lesson Plan						
II B.Tech I Sem		MATHEMATICS-IV	2018-19					
S. no	**Unit no**	**Topic**	**Week**	**No of sessions planned**	**Mode of teaching BB/PPT/OHP/MM**	**Reference ***	**Remarks**	
1	**UNIT-I**	Functions of a Complex variables:Introduction		1	BB	1.1		
2		Concepts of limits and continuity		1	BB	1.2 - 1.8		
3		Concepts of differentiability and analyticity		1		1.9		
4		analyticity properties		1	BB	1.9		
5		Cauchy -Riemann equations in Cartesian and polar coordinates		2	BB&ppt	1.13		
6		Tutorial class		1	BB			
7		Harmonic functions		2	BB	1.15		
8		Conjugate harmonic function		1	BB	1.16		
9		Milne -Thompson method		2	BB&ppt	1.19		
10		Tutorial class		1	BB			
11		Total class		13				
12	**UNIT-II**	Complex Integration:Line integral		1	BB	2.1		
13		Cauchy’s integral theorem		2	BB&p	2.4		

					pt			
14		Cauchy's integral formula		2	BB	2.5		
15		Tutorial class		1	BB			
16		Generalized integral formula		1	BB	2.8		
17		Power series : Taylor's series		2	BB	3.1		
18		Laurent series		1	BB	3.4		
19		Tutorial class		1	BB			
20		Sinular points and types		1	BB&PPT	4.1		
21		Residue & Cauchy Residue theorem		3	BB	4.4		
22		Tutorial class		1	BB			
23		Total class		16				
24	**UNIT-III**	Evaluation of integrals : TYPE -I method		1		5.1		
25		Type-II&III		3	BB	5.2 - 5.3		
26		Tutorial class		1	BB			
27		Bilinear transformation,Properties of bilinear transformations		2	BB	6.1		
28		Determination of bilinear transformations		2	BB	6.2		
29		Tutorial class		1	BB			
30		Total class		10				
31	**UNIT-IV**	Fourier series &Transforms:Introduction		1	BB&PPT	7.1		
32		Periodic &Fourier series of periodic functions		2	BB	7.2		
33		Dirichlet conditions , Even &Odd functions		2	BB	7.4 - 7.9		
34		Tutorial class		1	BB			
35		Fourier Integral theorem,Fourier sine &cosine transforms		2	BB	8.1		
36		properties,inverse transforms		2	BB&PPT	8.2		
37		Finite fourier transforms		2	BB	8.3		
38		Tutorial class		1	BB			
39		Total class		13				
40	**UNIT-V**	Applications of PDE:Classification of second order PDE		1	BB&PPT	9.1		
41		Method of separation of variables		2	BB	9.2		
42		Solution of one dimensional wave equation		4	BB	9.3		
43		Solution of one dimensional heat equation		4	BB	9.4		
44		Tutorial class		1	BB			
45		Total class		12				

TEXT BOOKS

T1 Afirst course in complex analysis with applications by Dennis G,Zill&PatrikShanahan, Johns &Bartlett Publishers

T2 Higher Engineering Mathematics by B.S. Grewal, Khanna Publishers

T3 Advanced Engineering Mathematics with

MATLAB by Dean G.Duffy

R1 Engineering Mathematics – I by T.K. V. Iyengar, B. Krishna Gandhi & Others, S. Chand.

R2 Fundamentals of Complex Analysis by Staff , E.B.&A.D Snider, Pearson

R3 Advanced Engineering Mathematics with Louis C.Barrett, McGraw Hill

4.4QUESTION BANK:

Unit-1 : FUNCTIONS OF A COMPLEX VARIABLE:

Short questions:

1. Define analytic function
2. Define Harmonic function
3. State Cauchy-Riemann equations
4. Write Cauchy-Riemann equations in polar form
5. Show that $u = \frac{x}{x^2+y^2}$ is harmonic.

1. State and prove Cauchy- Riemann equations .(5m)

2.Prove that $\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right)|realf(z)^2| = 2|f(z)|^2$ where f(z) is analytic.(5m)

3.Prove that z^n is analytic and hence find its derivative.(3m)

4. Determine p such that the function f(z) $=\frac{1}{2}\log(x^2+y^2) + i\tan^{-1}(\frac{px}{y})$ be an analytic function.(5m)

5.Showthat u(x,y)=e^{2x}(x cos2y – y sin2y) is Harmonic and Find its harmonic conjugate.

6.State and prove Cauchy Integral formula.(5m)

7.Find the analytic function whose real part is u = e^{2x}(x cos2y-y sin2y).

8.If the potential function is $\log(x^2+y^2)$, find the complex potential function.

9.Show that the function $f(z) = sinx\ coshy + i\ cosx\ sinhy$ is continuous as well as analytic every where.

10.state the necessary condition for f(z) to be analytic in Cartesian co-ordinates.

11.If u is a harmonic function , show that w = u^2 is not a harmonic unless u is constant.

12.Find the orthogonal trajectories of the family of curves $x^3y - xy^3 = c$ where c is constant .

13.find the orthogonal trajectories of the family of curves $r^2cos2\theta = c$.

14.Show that an analytic function with constant absolute value is constant.

15.Show that both the real and imaginary parts of an analytic function satisfies laplace's equation.

16.Find whether f(z) =$\frac{x-iy}{x^2+y^2}$ isanalytic or not .

17. Show that the function f(z) = z $\bar{z}$ is differentiable but not analytic at z = 0.

18. Show that $f(z) = cosz$ is analytic every where in the complex plane and find $f1(z)$.

19.Find k such that f(x , y)= x^3 +3kxy^2 may be harmonic and find its conjugate .

20. If f(z) = u+iv is analytic , and $v = \frac{2sinxsiny}{cos2x+cosh2y}$.

II) Multiple Choice Questions :

1) Derivative of a Analytic function is ----------( )
   a) continuous b) Analytic c) Differentiable d) None
   Ans: b
2) Cauchy- Riemann equations are-----( )
   a)$u_x = v_y$ and $v_x = -u_y$ b) $u_x = v_y$ and $v_x = u_y$ c) $u_x = u_y$ and $v_x = v_y$ d)none
   Ans:a
3) A continous function is differential ----------( )

(a) True ,(b) False. (c)True & False, (d) True or False

Ans:a

4) A function Φ(x, y) satisfying Laplace equation is called --------( )

(a) Analytic (b) Holomorphic (c) Harmonic, (d)Non-hormonic

Ans:c

5) Afunction f(z) = cosz is ----------( )

(a) Analytic everywhere , (b) Analytic nowhere (c) only differentiable, (d) None

Ans: a

6) If f(z) = u + iv is analytic in the z-plane , then v-iu is ----------( )

a)Analytic b) not analytic c) continuous d) none

Ans: a

7) An analytic function with constant modulus is ---------- -( )

(a) Constant , (b) not constant , (c) analytic , (d) None of these.

Ans: a

8) A Milne – Thomson method is used to construct ----------( )

a) analytic function , b) Continuous function c) differentiable function, d) None of these Ans:a

9. harmonic conjugate of e^xcosy is …….

a) e^xcosy + c (b) e^xsiny + c (c) e^x + c (d) None of these

10) The harmonic conjugate of e^{-y}sinx is …….

a) e^{-y} cosx + c (b) e^{-y} sinx + c (c) e^{-x} Siny (d) None of these Ans: c

11. The harmonic conjugate of $x^3 - 3xy^2$ is ----------

Ans:$3x^2y - y^3 + c$

12.C-R equations for a function to be analytic in polar form are -------

Ans: $u_r = \frac{1}{r}v_\theta$, $v_r = -\frac{1}{r}u_\theta$

Unit-2 : COMPLEX INTEGRATION:

4.5 SHORT QUESTIONS:

1. State Cauchy's (integral) theorem.
2. Expand $f(z) = sinz$ in Taylor's series about $z = \frac{\pi}{4}$

   State Taylor's theorem
3. State Laurent's theorem
4. State Cauchy's Residue theorem
5. Find residue of $f(z) = \frac{z}{z^2+1}$ at its poles
6.
7. State Cauchy's integral formula

4.6 LONG QUESTIONS :

1. Evaluate $\int \frac{e^{2z}}{(z-1)(z-2)}dz$ where c is the circle $|z|=3$.

2. Expand e^z as Taylor series about z=1.

3. Find Laurent series expansion of the function f(z)=$\frac{z2-6z-1}{(z-1)(z-3)(z+2)}$ in the region 3<z+2<5.

4. Find the residue of $\frac{ze^z}{(z-1)^3}$ at its poles.

5. Evaluate $\int \frac{e^{2z}}{(z-1)(z-2)}dz$ where c is the circle $|z|=3$.

6. Expand e^z as =∞Taylor series about z=1.

7.Find Laurent series expansion of the function f(z)=$\frac{z2-6z-1}{(z-1)(z-3)(z+2)}$ in the region 3<z+2<5.

8.Find the residue of $\frac{ze^z}{(z-1)^3}$ at its poles.

9.State and Prove Cauchy theorem.

10.State Laurent's theorem and give example.

11.Evaluate using cauchy's integral formula $\int_c \frac{e^{2z}}{(z-1)(z-2)}\, dz \; where\; c\; is\; the\; circle\; |z| = 3.$

12. Find taylor's series expantion for the function f(z) =$\frac{1}{(1+z)^2}$ with center at –i

13. Find the residue of $\frac{1}{(z-sinz)}$ at z = 0 .

14. .Find the residue of $\frac{z^2}{1-z^4}$ at those poles which lie inside the circle $|z| = 1.5$.

15.find the poles and residues at each pole of $\frac{2z+1}{1-z^4}$.

16.Expand the Laurent series of $\frac{z^2-1}{(z+2)((z+3))}$ for $|z| > 3$.

17. Evaluate $\int_c^{\infty} \frac{Ze^z}{(Z+2)^3}\, dz \; where\; c\; is\; |z| = 3$ using cauchy's integral formula .

18. State and Prove Cauchy's integral formula .

19. Evaluate $\int_0^{1+i} (x^2 - iy)\, dz$ along the paths i) y= x ii) $y=x^2$.

20.Find the poles and residues at each pole of $\frac{cotz\, cothz}{z^3}$.

Multiple choice :

1). The fixed points of the transformation $w=z^2$ are

a)0,1 b)0,-1 c)-1,1 d)i,-i

Ans: d

2.A mapping which preserves the angles between oriented curve in magnitude as well as in sense is called

a)conformal mapping b)non-conformal mapping c)function d)none

Ans: a

3. A critical point of the transformation $w =z^2$ is

a)z=i b)z=-i c)z=0 d)no critical points.

Ans: a

4. The value of $\int \frac{dz}{z^2-2z}$ where C is $|z-2|$ =1 is -------( )

a) –πi b)πi c) 2πi d) 0

Ans: b

5. The value of $\int \frac{cosz}{z}$ dz , where C is the ellipse $9x^2 + 4y^2 = 1$ --------( )

a)0 b) πi c) 2πi d) 4πi

Ans:c

6. The Value of $\int \frac{dz}{z^2-1}$ where C is the circle $x^2 + y^2 = 4$ is ----------( )

a)0 b))πi c) –πi d) 2πi

Ans:a

7.The value of $\int tan2\pi z$ dz where c is the circle $|z| = 1$ is ----------( )

a) 0 b) πi c)2 πi d)-2 πi

Ans:a

8. The period of the function e^{iz} is -----( )

a)π b)2 π c)4 π d) πi

Ans:b

9. The value of $\int_0^{1+i} z\,dz$ along the line z = 0 to z=1+i is ----------( )

a)0 b)i c)2i d)-2i

Ans: b

10. A continuous arc without multiple points is called a ------( )

a) continuous arc b) contour c) Jordan arc d) none

Ans: b

1. A point at which a function f(z) ceases to be analytic is called----------
   Ans: singular point
2. siniz is equal to ----------
   Ans: i sinhz
3. 13.The period of tanz is----------
   Ans: π
4. Real part of cosh z is ----------
   Ans: Coshx cosy
5. 15.w=log z is analytic everywhere except at z=----------
   Ans: zero

6. 16. Imaginary part of e^{2z} is ----------
   Ans: e^{2x} sin2y
7. 17.Cauchy's integral theorem is applicable only for a ---------- region R enclosed a simple curve c.
   Ans simply connected
8. 18.A sequence with more than one limiting point is ----------
   Ans: can not be convergent.
9. 19.A power series within its circle of convergence----------
   Ans: converges absolutely and uniformly.
10. 20.Every analytic function in a simply connected domain possess----------
    Ans: posses an indefinite integral.

UNIT:3 EVALUATION OF INTEGRALS AND BILINEAR TRANSFORMATIONS:

Short questions:

1. Define contour integration.
2. Define conformal mapping.
3. Define Bilinear transformation
4. Show that the bilinear transformation preserves the cross ratio
5. Find the fixed point of the transformation $w = \frac{3z-4}{z-1}$
6. Find the image of the circle $|z| = 2$ under the transformation$w = z + 3 + 2i$
7. Determine the region of w-plane into which the region is mapped by the transformation $w = z^2|z - 1 = 2|$

Long questions:

1. Show that $\int_0^{\pi} \frac{d\theta}{a+b\cos\theta} = \frac{\pi}{\sqrt{a^2-b^2}}$ (a>b>0) using Residue theorem.
2. Use Residue Theorem to evaluate $\int_0^{\infty} \frac{dx}{x^4+a^4}$
3. Determine the linear fractional transformation that maps z_1=0,z_2=1,z_3=∞ onto w_1=-1,w_2=-i ,w_3=1 respectively.
4. 4.Find the bilinear transformation which maps the points (-1,0,1) into the points(0,i,3i).
5. Find the fixed points of the transformation (1)w=$\frac{2i-6z}{iz-3}$ (2) w=$\frac{z-1}{z+1}$
6. Prove that the Bilinear transformation is conformal.
7. Show that the bilinear transformation preserves the cross ratio.
8. Show that the transformation w = $\frac{2z+3}{z-4}$ changes the circle $x^2+y^2-4x=0$ into the straight line 4u+3=0.∞
9. Evaluate $\int_0^{\infty} \frac{dx}{x^6+1}$ using Residue theorem.
10. Evaluate $\int_0^{2\Pi} \frac{cos2\phi}{5+4cos\phi}$d using Residue Theorem..
11. Show that $\int_0^{\pi} \frac{d\theta}{(5-3sin\theta)^2}$ using Residue theorem .
12. Show that $\int_0^{2\pi} \frac{d\theta}{2+cos\theta} = \frac{2\pi}{\sqrt{3}}$.
13. Find the bilinear transformation which transform the points (∞, i , o) in the z- plane into the points (0,i, ∞) in the w-plane.

14. Find the bilinear transformation which maps the points (1,i , -1) into the points (0,1,∞).
15. Show that the relation w =$\frac{5-4z}{4z-2}$ transforms the circle of radius unity in the w –plane.
16. Evaluate $\int_0^{2\pi} \frac{sin^2\theta d\theta}{a+bcos\theta}$ using residue theorem .
17. Show that I= $\int_0^{2\pi} \frac{1+4cos\theta d\theta}{17+8cos\theta}$.
18. Evaluate $\int_0^{\infty} \frac{dx}{(x^2+a^2)^2}$.
19. Evaluate $\int_{-\infty}^{\infty} \frac{(x^2-x+2)dx}{x^4+10x^2+9}$ using residue theorem .
20. Evaluate by contour integration $\int_0^{\infty} \frac{dx}{1+x^2}$.

Fill in the blanks:

1) Another name of bilinear transformation is ----------
   Ans: Mobious transformations
2) critical points of the mapping w=cosh z are ----------
   Ans: z=± nπi , n=0,±1,±2,…….
3) The critical point of the transformation w=$z^2$is z -------
   Ans:0,1
4) The cross-ratio of four points $z_1,z_2,z_3,z_4$is ------
   Ans:$\frac{(z_1-z_2)(z_3-z_4)}{(z_1-z_4)(z_3-z_2)}$
5) Bilinear transformation always transforms circles into ------
   A: circles
6) The invariant points of the transformation w = $\frac{1+z}{1-z}$ are z = ------
   A: ±i
7) The critical point of the mapping w^2 = (z-a)(z-b) is ------
   A: z= (a+b) / 2
8) The critical points of the mapping w = z + $\frac{1}{z}$ are -------
   A:z=±i
9) The bilinear transformation which maps z = 1,i,-1 respectively onto w = i, 0,-i is----------
   A: w=$\frac{i-z}{i+z}$
10) The point where f'(z) = 0 is called --------- of the transformation w = f(z).
    A: critical point

MULTIPLE CHOICE QUESTIONS:

11) The singular point of f(z)=$\frac{1-z}{1+z}$ is
    a)z=1 b)z=-1 c)z=i d)z= -i
    Ans: b
12) .The fixed points of w= $\frac{z}{2-z}$ are
    a)0,1 b)1,-1 c)-1,0 d)0
    Ans:a
13) . If the mapping w=f(z) is conformal then the function f(z) is
    a)analytic b)non-analytic c)harmonic d)none
    Ans:a
14) .The points whch are mapped on to themselves under a conformal mapping are called
    a. a)fixed points b)identity points c)conformal points d)none

Ans:a

15) . The fixed points of the transformation $w=\frac{z-1+i}{z+2}$ are

a. a)z=±1 b)z =±i c)z=-1,±i d)z=1,±i

Ans:c

16) . A critical point of the transformation $w=z^2$ is

a. a)z=i b)z=-i c)z=0 d)no criticalpoints

Ans: c

17) The value of $\int_0^{2\Pi} \frac{d\phi}{5-3cos\phi}$ d$\boldsymbol{\phi}$ is

a)0 b)Π/2 c)Π/4 d)none

Ans:b

18) .Poles of cotz are ----

a)z=nΠ b)2Π c)Π d)none

Ans:a

19) The critical points of the mapping w=cosz are

a)np b)2p c)p d)none.

Ans:a

20) . The fixed points of the transformation $w=\frac{6z-9}{z}$ are

a)z=3,3 b)z=-3,3 c) z= -3.-3 d)z=3i

Ans:b

UNIT-4 : FOURIER SERIES AND FOURIER TRANSFORM:

Short questions &long questions:

1. Define periodic function and write examples .
2. Define even and odd function .
3. Express the function f(x) as the sum of an even function and an odd function .
4. Find the functions are even or odd (i) x sinx+cosx+x^2coshx (ii)xcoshx+x^3sinhx.
5. if f and g are periodic functions with same period T show that (af+bg)are also periodic function of period T where a and b are real numbers.
6. Define Euler's formulae.
7. Write Dirichlet's conditions.
8. If f(x)= x^2 □ 2 in (-2,2) then find b_n.
9. If f(x)= x^2 in (-2,2) then a_n.
10. If f(x)= $\sin^3 x$ in (-Π,Π) then find a_n .
11. Find the Fourier series of f(x) =x+x^2 ,-π<x<π .

12. Obtain the Fourier series in$(-\pi,\pi)$ for the function $f(x)=x-\pi$.
13. Expand the function $f(x) =x^3$ as Fourier series in – $\pi<x<\pi$.
14. Find the Fourier series for the function f(x)=sin ax.
15. Find the Fourier cosine and sine series for $f(x) = \pi-x$. in [0,1].
16. Find the fourier series to represent $f(x)= x^2 -2$ when $-2<x<2$.
17. Find Fourier cosine and sine transforms of e^{-ax} ,a>0 and hence deduce the inversion formula .
18. Find the inverse fouriercosine transform f(x) of $F_C(p)$ $=P^n e^{-ap}$
19. Find the fourier cosine transform of e^{-ax}cosax.
20. Find fourier sine and cosine transforms of xe^{-ax}.

FILL IN THE BLANKS:

1) IF $F(X) = x^2$ in (-l , l) then b_1= ----------
   A: zero

2) If f(x) = x cosx in(-Π ,Π) then b_1 = ------
   A:zero

3) The half range sine series for f(x)= 1 in (0, Π) is -------
   A: $\frac{4}{\pi}$(sinx +$\frac{sin3x}{3}$+$\frac{sin5x}{5}$+……..)

4) In the half range cosine series of f(x) =x sinx ,0<x<Π ,the value of a_0 ------
   A: 2

5) The trigonometrical series of f(x) in the interval (-Π,Π) is --------
   A:$\frac{a_0}{2}+\sum_{n=1}^{\infty} a_n$ cosnx+$\sum_{n=1}^{\infty} b_n s\,innx$

6) $F_s(2e^{-5x}+5e^{-2x})$= ---------
   A:$\frac{2p}{p^2+25}+\frac{5p}{p^2+4}$

7) Fourier sine transform of e^{-x} is -------
   A:$\frac{p}{1+p^2}$

8) modulation theorem for fourier transforms states that --------

A: F(f(x)sinax) = $\frac{1}{2i}$(F(p+a) –F(p-a))

9).Fourier sine transform of f(x)= $\frac{1}{x}$ is --------

A:$\frac{\pi}{2}$

10) The Fourier sine transform of $\frac{e^{-ax}}{x}$ is -------

A:$\tan^{-1}(p/a)$

11) $F_c(e^{-at})$ = -------

a) $\frac{a}{p^2+a^2}$ b) $\frac{a}{p^2-a^2}$ c) $\frac{2ap}{p^2-a^2}$ d)none

A:a

12. Finite Fourier sine transform of f(t) = Π –t , 0<t<Π is -----

a)/$\frac{n}{\Pi}$ b)nΠ c) $\frac{\Pi}{n}$ d)0

A:

13. Continuous functions are sampled to form a

A) Fourier series B) Fourier transform

C) fast Fourier series D) digital image

A: a

14. 2D Fourier transform and its inverse are infinitely

A) Aperiodic b)periodic c)linear d)non linear

A: b

15. Product of two even or two odd functions is

a)Even b) odd c)prime d)aliasing

A:a

16. Odd functions are said to be

a)symmetric b)antisymmetric c) periodic d)aperiodic

A: b

17. Phase angle is represented by formula

a)sine(x/y) b)arcsine(x/y) c)tan(x/y) d)arctan(x/y)

A: d

18. 1. If $x(n)=x_R(n)+jx_I(n)$ is a complex sequence whose Fourier transform is given as $X(\omega)=X_R(\omega)$

+$jX_I(\omega)$, then what is the value of $X_R(\omega)$?

a) $\sum_{n=0}^{\infty} x_R(n)cos\omega n - x_I(n)sin\omega n$
b) $\sum_{n=0}^{\infty} x_R(n)cos\omega n + x_I(n)sin\omega n$
c) $\sum_{n=-\infty}^{\infty} x_R(n)cos\omega n + x_I(n)sin\omega n$
d) $\sum_{n=-\infty}^{\infty} x_R(n)cos\omega n - x_I(n)sin\omega n$ Ans: b

19. . If x(n) is a real sequence, then what is the value of $X_I(\omega)$?

a) $\sum_{n=-\infty}^{\infty} x(n)\sin(\omega n)$
b) $-\sum_{n=-\infty}^{\infty} x(n)\sin(\omega n)$
c) $\sum_{n=-\infty}^{\infty} x(n)\cos(\omega n)$
d) $-\sum_{n=-\infty}^{\infty} x(n)\cos(\omega n)$ Ans:c

20. If x(n) is a real signal, then $x(n)=\frac{1}{\pi}\int_0^{\pi}[X_R(\omega)\cos\omega n - X_I(\omega)\sin\omega n]\,d\omega$

a) True

b) False c)none Ans:a

UNIT-5 APPLICATIONS OF PDE:

SHORT QUESTIONS &LONG QUESTIONS:

1. Define order and degree with reference to partial differential Equation.
2. Eliminate the arbitrary constants ax+by+cz=1.
3. Form PDE by eliminating arbitrary function $z=f(x^2+y^2)$.
4. Define complete integral with reference to nonlinear partial differential equation?
5. Define general integral with reference to nonlinear partial differential equation?
6. Solve $p^2+q^2=m^2$.
7. Solve $z=px+qy+p^2q^2$
8. Write the wave one dimension equation?
9. Write the heat one dimension equation?
10. Solve $\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t}+u$ where $u(x,0)=6.e^{-3x}$.
11. Solve by the method of separation of variables $2xz_x-3yz_y=0$.
12. solve the boundary value problem $u_{tt}=a^2u_{xx}$; $0<x<l$; $t>0$ with $u(0,t)=0$; $u(l,t)=0$ and $u(x,o)=0$,$u_t(x,0)=\sin^3(\frac{\pi x}{l})$.

13. Find the general solution of the wave equation $\frac{\delta^2 u}{\delta t^2} = c^2 \frac{\delta^2 u}{\delta x^2}$.

14. Derive the complete solution for the one dimentional heat equation with boundary conditions

problem with initial temperature.

15. Find the physically feasible solution of one –dimensional heat flow equation .

16. write the three possible solutions of $\frac{\partial u}{\partial t} = \frac{\delta^2 u}{\delta x^2}$.

17. A bar 100 cm long with insulated sides has its ends kept at 0^0 C and 100^0 C until steady state conditions.

The two ends are then suddenly insulated and kept so. Find the temperature distribution

18. Find the temperature in a thin metal rod of length of L with both ends insulated and with initial temperature

In the rod is sin ($\frac{\pi x}{L}$).

19. Derive the complete solution for the one dimensional heat equation with zero boundary conditions problem with

initial temperature u (x, 0) = x(L-x) in the interval (0, L)

MULTIPLE CHOICE QUESTIONS:

1. For partial differential equation, if $b^2 - 4ac = 0$ then equation is called

A. hyperbolic
B. parabolic
C. elliptic
D. None of these

Ans: b

2. Boundary condition which include direct boundary value is

A. Dirichlet boundary condition
B. Neumann boundary condition
C. forced boundary condition
D. discrete boundary condition

Ans: a

3. Region of flow trailing a body where effect of that body is felt on velocity field is called

A. flow region
B. wake
C. trailing region
D. velocity region

Ans: b

4.Measure of circulation of fluid is called

A. stability
B. vorticity
C. viscosity
D. None of these

Ans: b

5.Flow in which each particle of fluid follows an irregular path is called

A. laminar flow
B. turbulent flow
C. mixed flow
D. None of these

Ans: b

6 .The solution of the partial differential equation $yzp + zxq = xy$ is given by

E. A) $x^2 + y^2 = c_1$ and $x^2 + z^2 = c_2$

F. B) $x^2 - y^2 = c_1$ and $x^2 - z^2 = c_2$

G. C) $x^2 + y^2 = c_1$ and $x^2 - z^2 = c_2$

H. D) $x^2 - y^2 = c_1$ and $x^2 + z^2 = c_2$

I. Ans:c

J. 7. The solution of the partial differential equation $xzp + yzq = xy$ is

A) $\phi(x - y, y - z) = c_1$

B) $\phi(xyz) = c_2$

C) $\phi(xz, y) = c_3$

D) $\phi(\frac{x}{y}, \frac{y}{z}) = c_4$

Ans: d

8. A partial differential equation requires

- exactly one independent variable
- two or more independent variables
- more than one dependent variable
- equal number of dependent and independent variables

Ans: b

9. Using substitution, which of the following equations are solutions to the partial differential equation?

$$\frac{\partial^2 u}{\partial x^2} = 9\frac{\partial^2 u}{\partial y^2}$$

- $\cos(3x - y)$
- $x^2 + y^2$
- $\sin(3x - 3y)$
- $e^{-3x}\sin(xy)$

Ans: d

4.7 ASSIGNMENT TOPICS:

1. State and prove Cauchy- Riemann equations .(5m)
2. Prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|real f(z)^2| = 2|f(z)|^2$ where f(z) is analytic.(5m)
3. Determine p such that the function f(z) =$\frac{1}{2}$log (x^2+y^2) +i $\tan^{-1}(\frac{px}{y})$ be an analytic function.(5m)
4. Show that u(x,y)=e^{2x}(x cos2y – y sin2y) is Harmonic and Find its harmonic conjugate.
5. State and prove Cauchy Integral formula.(5m)
6. .Find the analytic function whose real part is u = e^{2x}(x cos2y-y sin2y).
7. Find whether f(z) =$\frac{x-iy}{x^2+y^2}$ isanalytic or not .
8. Show that the function f(z) = z $\bar{z}$ is differentiable but not analytic at z = 0.
9. Show that $f(z) = cosz$ is analytic every where in the complex plane and find $f1(z)$.
10. Find k such that f(x , y)= x^3 +3kxy^2 may be harmonic and find its conjugate .
11. If f(z) = u+iv is analytic , and $v = \frac{2sinxsiny}{cos2x+cosh2y}$.

12. Expand e^z as Taylor series about z=1.

13. Find Laurent series expansion of the function f(z)=$\frac{z2-6z-1}{(z-1)(z-3)(z+2)}$ in the region 3<z+2<5.

14. Expand the Laurent series of $\frac{z^2-1}{(z+2)((z+3))}$ for $|z| > 3$.

15. Evaluate $\int_c^{\infty} \frac{Ze^z}{(Z+2)^3}\, dz \; where \; c \; is \; |z| = 3$ using cauchy's integral formula .

16. State and Prove Cauchy's integral formula .

17. Evaluate $\int_0^{1+i}(x^2 - iy)\, dz$ along the paths i) y= x ii) $y=x^2$.

18. Find the poles and residues at each pole of $\frac{cotz\, cothz}{z^3}$.

19. Show that $\int_0^{\pi} \frac{d\theta}{a+bcos\theta} = \frac{\pi}{\sqrt{a^2-b^2}}$ (a>b>0) using Residue theorem.

20. Use Residue Theorem to evaluate $\int_0^{\infty} \frac{dx}{x^4+a^4}$

II-ASSIGNMENT TOPICS:

21. Prove that the Bilinear transformation is conformal.
22. Show that the bilinear transformation preserves the cross ratio.
23. Show that the transformation w = $\frac{2z+3}{z-4}$ changes the circle $x^2 + y^2 - 4x = 0$ into the straight line 4u+3=0.
24. Show that the transformation w= $\frac{3-z}{z-2}$ transforms the circle $\left|z - \frac{5}{2}\right| = \frac{1}{2}$ in the z plane into the imaginary axis in w plane
25. Evaluate $\int_0^{\infty} \frac{dx}{x^6+1}$ using Residue theorem.
26. Find the bilinear transformation which maps the points (1,i , -1) into the points (0,1,∞).
27. Show that the relation w =$\frac{5-4z}{4z-2}$ transforms the circle of radius unity in the w –plane.
28. Evaluate $\int_0^{2\pi} \frac{sin^2\Theta d\theta}{a+bcos\theta}$ using residue theorem.
29. Show that I= $\int_0^{2\pi} \frac{1+4cos\Theta d\theta}{17+8cos\theta}$.
30. Evaluate $\int_0^{\infty} \frac{dx}{(x^2+a^2)^2}$ .If $f(x)= \sin^3 x$ in (-Π,Π) then find a_n .

31. Find the Fourier series of $f(x) = x+x^2, -\pi<x<\pi$.
32. Obtain the Fourier series in(-π,π) for the function f(x)=x-π .
33. Expand the function $f(x) = x^3$ as Fourier series in $-\pi<x<\pi$.
34. Find the Fourier series for the function f(x)=sin ax.
35. Find the Fourier cosine and sine series for f(x) = π-x . in [0,1].
36. Find the Fourier cosine and sine series for f(x) = π-x . in [0,1].
37. Find the Fourier series to represent $f(x) = x^2 - 2$ when -2<x<2 .

38. Expand the function f(x) = x^2 as a Fourier series in $(-\pi, \pi)$ and hence deduce that i)$\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2}$ + ------- = $\frac{\pi^2}{12}$ ii) $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} +$ ------- = $\frac{\pi^2}{6}$

39. Using the Fourier integral show that

i) e^{-ax}-e^{-bx} = $\frac{2(b^2-a^2)}{\pi} \int_0^\infty \frac{\lambda sin\lambda x}{(\lambda^2+a^2)(\lambda^2+b^2)} d\lambda$

ii) e^{-x} cosx = $\frac{2}{\pi} \int_0^\infty \frac{\lambda^2+2}{\lambda^4+4} cos\lambda x \, d\lambda$

40. Find Fourier cosine and sine transforms of e^{-ax} ,a>0 and hence deduce the inversion formula .

41. Solve $\frac{\partial u}{\partial x}$ = 2 $\frac{\partial u}{\partial t}$ +u where u(x, 0) =6.e^{-3x} .

42. Solve by the method of separation of variables $2xz_x$-$3yz_y$= 0.

43. solve the boundary value problem u_{tt} =a^2u_{xx} ; 0<x<l ; t>0 with u(0,t)= 0; u(l,t)=0 and u(x,o)=0 ,u_t(x,0)=$sin^3(\frac{\pi x}{l})$.

44. Find the general solution of the wave equation $\frac{\delta^2 u}{\delta t^2}$ = $c^2 \frac{\delta^2 u}{\delta x^2}$.

45. Derive the complete solution for the one dimensional heat equation with boundary conditions

46. Problem with initial temperature.

4.8 TUTORIAL TOPICS:

1.state the necessary condition for f(z) to be analytic in Cartesian co-ordinates.

2 .If u is a harmonic function , show that w = u^2 is not a harmonic unless u is constant.

3.Find the orthogonal trajectories of the family of curves $x^3y - xy^3 = c$ where c is constant .

4.find the orthogonal trajectories of the family of curves $r^2 cos2\theta = c$.

5.Show that an analytic function with constant absolute value is constant.

6.Show that both the real and imaginary parts of an analytic function satisfies laplace's equation.

7.Find whether f(z) =$\frac{x-iy}{x^2+y^2}$ isanalytic or not .

8. Show that the function f(z) = z $\bar{z}$ is differentiable but not analytic at z = 0.

9. Find taylor's series expantion for the function f(z) =$\frac{1}{(1+z)^2}$ with center at –i

10. Find the residue of $\frac{1}{(z-sinz)}$ at z = 0 .

11. .Find the residue of $\frac{z^2}{1-z^4}$ at those poles which lie inside the circle $|z| = 1.5$.

12.find the poles and residues at each pole of $\frac{2z+1}{1-z^4}$.

13.Expand the Laurent series of $\frac{z^2-1}{(z+2)((z+3))}$ for $|z| > 3$.

14. Evaluate $\int_c^{\infty} \frac{Ze^z}{(Z+2)^3} dz$ *where c is* $|z| = 3$ using cauchy's integral formula .

15. State and Prove Cauchy's integral formula .

16.Evaluate $\int_0^{2\Pi} \frac{cos2\phi}{5+4cos\phi}$d using Residue Theorem..

17.Show that $\int_0^{\pi} \frac{d\theta}{(5-3sin\Theta)^2}$ using Residue theorem .

18.Show that $\int_0^{2\pi} \frac{d\theta}{2+cos\theta} = \frac{2\pi}{\sqrt{3}}$.

19.Find the bilinear transformation which transform the points (∞, i , o) in the z- plane into the points (0,i, ∞) in the w-plane.

20.Find the bilinear transformation which maps the points (1,i , -1) into the points (0,1,∞).

PROGRAMME: B.Tech ECE AC:YEAR: **2018-2019**	DEGREE: **B.TECH II YEAR**
COURSE: **ENVIRONMENTAL SCIENCE & TECHNOLOGY**	SEMESTER: **I** CREDITS: COURSE COORDINATOR: Mr.E.Srikrishna
COURSE CODE: MC300ES REGULATION:**R16**	COURSE TYPE: **REGULAR**
COURSE AREA/DOMAIN:	CONTACT HOURS: 3 hours/Week.
CORRESPONDING LAB COURSE CODE : NILL	LAB COURSE NAME: NILL

5.1 COURSE OVERVIEW:

As per the Supreme Court direction the Union of India has been included Environmental Education in the curriculum right from the school stage to college/University level since 1988.

The University Grants Commission decided to address the issue of Environmental Studies by introducing a basic course on Environment at the undergraduate level. The prime objective for the inclusion of the subject irrespective to all the branches in engineering courses is to make everyone environment literate. The degradation of the environment is linked with the development process. The development should be in a sustainable way which not only meets the present needs but also should compromise the ability of future generations to meet their own needs. Environmental Science is an interdisciplinary academic field that integrates Physical and biological sciences (including physics, chemistry, biology, soil science, geology and geography) to the study of the environment and the solutions of environmental problems. course description is: multidisciplinary in nature. The course content is divided in to five Units, Ecosystems, Natural Resources, biodiversity and biotic Resources, Environmental Pollution and Control technologies and Environmental Policy, Legislations & EIA for the convenience of academic Teaching and learning process

5.2 PRE-REQUISITES:

LEVEL	Credits	Periods/ Week	Prerequisites
UG	4	4	Knowledge of disaster management and its mitigation

5.3 MARKS DISTRIBUTION:

Session Marks	University End Exam Marks	Total Marks
Mid Semester Test • There shall be two midterm examinations. • Each midterm examination consists of subjective type and objective type tests. • The subjective test is for 10 marks of 60 minutes duration. • Subjective test of shall contain 4 questions; the student has to answer 2 questions, each carrying 5 marks. • The objective type test is for 10 marks of 20 minutes duration. It consists of 10 multiple choice and 10 objective type questions, the student has to answer all the questions and each carries half mark. • First midterm examination shall be conducted for the first two and half units of syllabus and second midterm examination shall be conducted for the remaining portion. **Assignment** • Five marks are earmarked for assignments. • There shall be two assignments in every theory course. Marks shall be awarded considering the average of two assignments in each course.	75	100

5.4 EVALUATION SCHEME:

S. No	Component	Duration	Marks
1	I Mid Examination	80minutes	100
2	II Mid Examination	80minutes	100

5.5 COURSE OBJECTIVES & OUTCOMES:

Course Objectives	Course Outcomes	Blooms Level
Understanding the importance of ecosystems, ecological balance for sustainable development.	Understand the scarcity of natural resources and will be able to replace them with alternative energy sources for the sustainability of the environment, society and economy.	BL1,2
Recognize the significance of Natural resources, their classification and alternative energy sources for the sustainability of the environment, society and economy by appropriate maintenance of natural resources.	Recognize the types of biodiversity along with the Values and conservation biodiversity and know about the biogeographically regions	BL 1,2,4
Understand the biodiversity and types of biodiversity along with the Values and conservation of biodiversity	Categorize the types of environmental pollution and the various treatment technologies for the diminution of environmental pollutants and contaminants.	BL 1,2,3
Categorize the types of environmental pollution and the various treatment technologies for the diminution of environmental pollutants and contaminants.	.Summarize the global environmental issues and to create awareness about the international conventions and protocols for extenuating global environmental problems.	BL 1,2,5
Summarize the global environmental issues and to create awareness about the international conventions and protocols for extenuating global environmental problems.	Understand the importance of Environmental legislation policies	BL 3,5,6

Understand the sustainable development concept and importance of green building understand the importance of EIA,EIS and EMP.	Understand the importance of sustainable development concept of green building	BL2,4,6

BLOOMS LEVEL (BL)

BL 1: Remember / knowledge BL2: Understanding BL3: Apply
BL 4: Analyze BL 5: Evaluate BL 6: Create

5.6 HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes		Level	Proficiency assessed by	Blooms Level
A	An ability to apply knowledge of mathematics, science and engineering	S	Solving Gate and Text book Problems	APPLY
B	An ability to design and conduct experiments, as well as to analyze and interpret data	S	Solving Gate and Text book Problems	APPLY
C	An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.	H	Assignment and Gate questions	Apply and Analyze
D	An ability to identify, formulate and solve engineering problems.	S	Class Test & Group Activity	Apply
E	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	S	Mini and Micro Projects	Apply
F	An ability to understand the special duty they owe to protect the public's health, safety and welfare by virtue of their professional status as engineers in society.	N	--	--
G	An ability to understand and correctly interpret the impact of engineering solutions in global, societal and environmental contexts and demonstrate the knowledge of a need for sustainable development.	H	Mini / Micro Projects and GATE questions	Analyze and Justify
H	An understanding of professional and ethical responsibility.	N	--	--

I	An ability to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	S	Class Test & Seminar	Analyze
J	An ability to 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, give and receive clear instructions.	S	Seminars	Understand & Analyze
K	An ability to demonstrate knowledge and understanding of the engineering finance and management principles as a member and leader in a team to manage projects in multi-disciplinary environments.	S	Mini and Micro Projects	Apply
L	Recognition of the need for, and an ability to engage in life-long analyzing.	S	Group Activity	Analyze
M	An ability to design and implement projects in the areas including Signal Processing, Microwaves, Communication Systems, IC Technology and Embedded Systems.	H	Mini and Micro Projects	Apply
N	An ability to use knowledge in various domains to identify research gaps and hence to provide solution to new ideas and innovations.	S	Seminars & Projects	Analyze & Apply

N = None S = Supportive H = Highly Related

5.7 SYLLABUS:

ENVIRONMENTAL SCIENCE & TECHNOLOGY:

UNIT-I :

Ecosystems: Definition, Scope and Importance of ecosystem. Classification, structure and function of an ecosystem, Food chains, food webs and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

UNIT-II:

Natural Resources: Classification of Resources: Living and Non-Living resources, water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems.

Mineral resources:

use and exploitation, environmental effects of extracting and using mineral resources, Land resources: Forest resources, Energy resources: growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies .

UNIT-III:

Biodiversity And Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife,
man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity.

UNIT-IV:

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards.
Water pollution: Sources and types of pollution, drinking water quality standards. Soil Pollution: Sources and types, Impacts of modern agriculture, degradation of soil.
Noise Pollution: Sources and Health hazards,
standards, Solid waste: Municipal Solid Waste management, composition and characteristics of e-Waste and its management.
Pollution control technologies: Wastewater Treatment methods: Primary, secondary and Tertiary. Overview of air pollution control technologies, Concepts of bioremediation.

Global Environmental Problems and Global Efforts:

Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol and Montréal Protocol.

UNIT-V:

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste m anagement and handling rules, hazardous waste management and handling rules.
EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP).

Towards Sustainable Future:

Concept of Sustainable Development, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

SUGGESTED TEXT BOOKS:

1 Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.

2 Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T.Wright. 2008 PHL Learning
2. Private Ltd. New Delhi.
   Environmental Engineering and science by Gilbert M.Masters and Wendell P. Ela .2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B.Botkin & Edward A.Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4 th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.

5.8 COURSE PLAN:

Lecture Number	Unit	Topics to be Covered	Reference
1	I	**Introduction**	A1,A3
2	I	Definition, Scope and Importance of ecosystem.	A1,A3
3	I	Classification of ecosystem	A1,A3
4	I	Classification of ecosystem	A1,A3
5	I	Structure of ecosystem	A1,A3
6	I	function of an ecosystem	A1,A3
7	I	Food chains	A1,A3
8	I	food webs	A1,A3
9	I	ecological pyramids	A1,A3
10	I	Flow of energy	A1,A3
11	I	Biogeochemical cycles	A1,A3
12	I	Biogeochemical cycles	A1,A3
13	I	Biogeochemical cycles	A1,A3
14	I	Bioaccumulation	A1,A3
16	I	Biomagnification	A1,A3
16	I	ecosystem value, services	A1,A3
17	II	Classification of Resources	A1,A3
18	II	Living and Non-Living resources	A1,A3
20	II	floods and droughts	A1,A3
21	II	Dams: benefits and problems	A1,A3
22	II	Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources	A1,A3

23	II	Land resources: Forest resources	A1,A3
24	II	Energy resources: growing energy needs	A1,A3
25	II	renewable and non renewable energy sources	A1,A3
26	II	use of alternate energy source, case studies	A1,A3
27	III	Introduction, Definition	A1,A3
28	III	genetic, species and ecosystem	A1,A3
29	III	diversity	A1,A3
30	III	Value of biodiversity; consumptive use	A1,A3
31	III	productive use, social, ethical, aesthetic and optional values	A1,A3
32	III	India as a mega diversity nation	A2
33	III	Hot spots of biodiversity	A2
34	III	Threats to biodiversity: habitat loss, poaching of wildlife	A2
35	III	man-wildlife conflicts	A2
36	III	conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act	A2
37	IV	Environmental Pollution:Classification of pollution	A2
38	IV	Air Pollution: Primary and secondary pollutants Automobile and Industrial pollution Ambient air quality standards	A2
39	IV	Water pollution: Sources and types of pollution, drinking water quality standards	A2
40	IV	Soil Pollution: Sources and types, Impacts of modern agriculture, degradation of soil	A2
41	IV	Noise Pollution: Sources and Health hazards, standards	A2
42	IV	Solid waste: Municipal Solid Waste management, composition and characteristics of e-Waste and its management	A2
43	IV	Pollution control technologies: Wastewater Treatment	A2
44	IV	Overview of air pollution control technologies, Concepts of bioremediation	A2
45	IV	Environmental Problems and Global Efforts: Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS)	A2

46	IV	Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol	A2
47	V	Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act	A2
48	V	Wild life Act, Municipal solid waste management and handling rules	A2
49	V	biomedical waste management and handling rules	A2
50	V	hazardous waste management and handling rules	A2
51	V	EIA: EIA structure, methods of baseline data acquisition	A2
52	V	Overview on Impacts of air, water, biological and Socio-economical aspects	A2
53	V	Strategies for risk assessment, Concepts of Environmental Management Plan (EMP)	A2
54	V	Sustainable Future: Concept of Sustainable Development	A2
55	V	Population and its explosion,Crazy Consumerism	A2
56	V	Environmental Education, Urban Sprawl, Human health, Environmental Ethics	A2
57	V	Concept of Green Building, Ecological Foot Print, Life Cycle	A2

5.9 MAPPING COURSE OBJECTIVES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES:

Course Objective	Course Outcomes				
	a	b	c	d	e
I	S				
II	S	S			
III			H		
IV				H	S
V					S

S= Supportive H= Highly Related

5.10 MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES:

Course Outcomes	Program Outcomes													
	a	b	c	d	e	f	g	h	i	j	k	l	m	n
a	S													
b	S	S									S			
c	S	S												
d		S					S				S			
e	S		S		S		S				S			

S= Supportive H= Highly Related

5.11 QUESTION BANK

S NO	QUESTION	Blooms taxonomy level	Course Outcome
	UNIT - I ECOSYSTEMS		
	Part - A (Short Answer Questions)		
1	**Define** ecology and ecosystem.	Remember	1
2	**Differentiate** between food chain and food web.	Understan	1
3	**Define** pyramid of energy.	Remember	1
4	**Briefly** discuss about grassland ecosystem	Analyze	1
5	**Explain** few important characteristics of a forest ecosystem	Understan	1
6	**Define** ecological pyramids.	Understan	1
7	**Define** pyramid of energy.	Remember	1
8	**Differentiate** between grazing food chain detritus food chain.	Analyze	1
9	**Define** photosynthesis process.	Remember	1
10	**Enlist** the types of grasslands in India and two animal species	Remember	1
	Part - B (Long Answer Questions)		
1	**Discuss** the major characteristics features of a river ecosystem different	Remember	1
2	**Enlist** the main components of ecosystem and briefly describe the functions	Remember	1
3	**Explain** the role of producers, consumers and decomposers in an	Understan	1
4	**What** are food chain and food web? Give example and discuss their	Remember	1
5	**What** are biogeochemical cycles? Explain nitrogen cycle with help of a	Understan	1

6	**Describe** five ecosystems goods and services that human	Understan	1
7	**Discuss** the structure and function of desert ecosystem.	Analyze	1
8	**Explain** phosphate and sulphate cycles.	Understan	1
9	**Explain** briefly about indicators of the quality of ecosystem.	Understan	1
10	**What** is meant by biomagnifications? Explain	Understan	1
11	Sustainable management of natural resources is essential to provide	Analyze	1,2
Part - C (Problem Solving and Critical Thinking Questions)			
1	**Explain** how different development activities, including construction of dams, affect the various ecosystems and what action need	Understan	1
2	**Explain** the impacts of pesticide and other agro chemicals on any	Understan	1
3	**Explain** with examples the links between the activities of man which are	Understan	
4	**Discuss** how are life system affected by stress?	Analyze	1
5	What impacts do human activities have on populations, communities and	Remember	1
6	**Write** a brief scenario describing the sequence of consequences to us other forms of life if decomposers and detritus feeders were some how eliminated, all producers on land in upper zone of aquatic ecosystems were eliminated by drastic increases in UV radiation region earth surface due to loss of protective stratosphere ozone layer.	Evaluate	1,4,5
7	**Explain** the significance of preserving of balance in various kinds of	Apply	1
8	**Discuss** models of energy flow in an ecosystem	Analyze	1
9	**What** is homeostasis? What are feedback mechanism	Apply	1
10	**Explain** the significance of preserving of balance in various kinds of	Apply	1
UNIT - II NATURAL RESOURCES			
Part – A (Short Answer Questions)			
1	**Enumerate** some of the water resources problems in India.	Analyze	3
2	**Discuss t**he problems of over exploitation of ground water.	Analyze	3
3	**Enlist** different surface and ground water resources.	Remember	4
4	**What** are the environmental effects of using of mineral	Remember	3
5	**What** is mineral? What is its use?	Understan	3
6	**What** is water logging?	Understan	3
7	**What** is soil erosion?	Understan	3
8	**What** are the effects of soil pollution?	Analyze	3
9	**Differentiate** soil texture and structure.	Analyze	3
10	**What** are the different types of natural resources	Remember	3
Part - B (Long Answer Questions)			
1	**What** are Natural resources and write the classification of	Remember	2
2	**Discuss** Big dams - Benefits and problems	Understan	2,3
3	**What** are Mineral Resources, uses and exploitation?	Remember	2,3
4	**What** are alternate energy sources? Explain their present status, merits and	Analyze	2,3

5	**What** are the different types of energies which can be derived from the	Analyze	2,3
6	**Describe** the merits and demerits of nuclear power energy and discuss the	Analyze	2,3
7	**Write** a note on solar energy; also discuss about the solar cells with a diagram and enumerate its applications	Understan	3
8	**Write** a note on growing energy needs?	Remember	3
9	**What** are non renewable energy resources; explain in detail.	Analyze	2,3
10	**What** is an aquifer? Discuss its types?	Understan	2
	Part – C (Problem Solving and Critical Thinking)		
1	**Summarize** a detailed report on the management of water and waste water in your town/city?	Remember	2,4
2	Discuss with the help of a case study, how big dams have affected forests	Understan	2
3	**What** mineral resource is extracted in your local area? What mining methods are used.	Remember	2
4	**Evalute** timber harvesting on private and public land s in the local area ?	Understan	2,3
5	**How** electricity in your community is is produced? Does your community	Apply	1,2
6	**Explain** the effects of dams on tribal people with special reference to	Remember	2,3
7	**Discuss** the role played by the non conventional; energy resources towards	Understan	2,3
8	**What** is biogas; discuss the structure and function of the biogas.	Remember	2,3
9	**Write** a note on solar energy; also discuss about the solar cells with a	Understan	2,3
10	Briefly discuss droughts and floods with respect to their occurrence and impacts.	Apply	2,3
	UNIT-III **BIODIVERSITY**		
	Part - A (Short Answer Questions)		
1.	**Enumerate** the biogeographically classification of India.	Analyze	4
2.	**What** do you mean by hot spots of biodiversity? Mention the three hot	Remember	4
3.	**Differentiate** between endanger and endemic species.	Differentia	4
4.	**What** is meant by in situ and ex situ conservation of	Understan	4
5.	**What** does NBPGR AND NBAGR stand for? Where are they	Analyze	4
6.	**Enlist** the indirect values of biodiversity	Remember	4
7.	**Define** biological diversity.	Understan	4
8	**Differentiate** genetic and species diversity.	Analyze	4
9.	**Define** national biodiversity act.	Understan	4
10.	**How** do you consider India as a nation of mega diversity nation?	Analyze	4
	Part – B (Long Answer Questions)		
1	**Discuss** the causes of man-wild life conflicts. Suggest suitable wild life conservation practices.	Analyze	4
2	**What** is biodiversity? Explain different types of biodiversity.	Understan	4
3	**Explain** in-situ and ex-situ conservation of biodiversity	Understan	4

4	**Briefly** explain endangered species of India?	Remember	4
5	**Identify** and explain the present day major threats to the biodiversity of	Analyze	4
6	**Discuss** the various strategies of conservation of biodiversity?	Analyze	4
7	**Write** the direct and indirect values of biodiversity?	Analyze	4
8	**Explain** the necessity for viewing the biodiversity as a global resource.	Analyze	4
9	**Write** a brief note on conservation of biodiversity?	Understan	4
10	**Write** the direct and indirect values of biodiversity?	Remember	4
	Part – C (Problem Solving and Critical Thinking)		
1	**What** are environmental hot spots of your city? Explain the possible factors observed by you for degradation of quality of hot spot. Suggest suitable engineering measure to restore their quality.	Understand	4
2	**How** do different developmental activities, including construction of dams, affect the biodiversity and action need to be taken to conserve them.	Evaluate	4
3	**What** are environmental hot spots of your city? Explain the possible factors observed by you for degradation of quality of hot spot. Suggest suitable engineering measure to restore their quality.	Evaluate	4
4	**Identify** examples of habitat destructuction or degradation in your local community that had harmfull effects on the populations of various wild plant and animal species.	Evaluate	4
5	**Evaluate** cattle grazing on private and public rangeland and pastures in	Analyze	4
6	**Comment** upon Indian biodiversity with special reference as a megadiversity nation. How do biosphere reserves help in conservation of biodiversity.	Apply	4
7	**What** are the different services that are contributed in various ways by biodiversity?	Apply	4
8	**Discuss** the various strategies of conservation of biodiversity?	Understan	4
9	Enumerate five important biosphere reserves, national parks and wild life sanctuaries of India	Apply	4
10	**Identify** and explain the present day major threats to the biodiversity of India?`	Apply	4
	UNIT-IV **ENVIRONMENTAL POLLUTION AN CONTROL TECHNOLOGIES**		
	Part – A (Short Answer Questions)		
1	**Write** about environmental pollution and explain their types.	Understan	5
2	**Define** air pollution and describe the technologies for the control of air pollution.	Remember	5,6

3	**Explain** primary and secondary sources of air pollution?	Understan	5
4	**Write** about environmental pollution and explain their types.	Remember	5
5	**What** are the effects of water pollution and enumerate drinking water quality standards	Remember	5,6

6	**Briefly** explain the Municipal Solid Waste management	Apply	5,6
7	**Write** a note on climate change and impacts on human environment	Understand	6
8	**Explain** Ozone depletion and Ozone depleting substances (ODS).	Evaluate	6
9	**List** out the Sewage treatment plants, effluent treatment plants and	Evaluate,	6
10	**What** are the problems encountered in the disposal of solid waste from	Analyze	5
	Part – B (Long Answer Questions)		
1	**List** out the Sewage treatment plants, effluent treatment plants and	Understan	5,6
2	**What** are the problems encountered in the disposal of solid waste from various sources?	Apply	5,6
3	**How** e-waste can be effectively managed.	Apply	5,6
4	**List** out the Sewage treatment plants, effluent treatment plants and	Remember	5,6
5	**How** many times during each of past five years have levels of testeted	Creating	5,6
6	**Compare** weather strom drains and sanitary sewers combines or separate in your area? Are there plans to reduce pollution from strom water runoff?	Evaluate	5,6
7	**Develop** and action plan for reducing your exposure to indoor air pollution.	Remember	5,6
8	**Identify** at least two moral and ethical responses each to the issue of global	Remember	5,6
9	**Compare** From available air quality data determine weather outdoor air	Evaluate	5,6
10	**Discuss** the salient features of earth summit.	Apply	5,6
	Part – C (Problem Solving and Critical Thinking)		
1	**Write** about environmental pollution and explain their types.	Understan	5
2	**Define** air pollution and describe the technologies for the control of air	Remember	5,6
3	**Explain** primary and secondary sources of air pollution?	Understan d	5
4	**Write** about environmental pollution and explain their types.	Remember	5
5	**What** are the effects of water pollution and enumerate drinking water quality standards	Remember	5,6
6	**Briefly** explain the Municipal Solid Waste management	Apply	5,6

7	**Write** a note on climate change and impacts on human	Understan	6
8	**Explain** Ozone depletion and Ozone depleting substances	Evaluate	6
9	**List** out the Sewage treatment plants, effluent treatment plants and common effluent treatment plants in your vicinity.	Evaluate,	6
10	**What** are the problems encountered in the disposal of solid waste from various sources?	Analyze	5
	UNIT-V **ENVIRONMENTAL POLICY, LEGISLATION AND EIA**		
	Part - A (Short Answer Questions)		
1	**Enlist** the objectives of Air pollution act.	Remember	6,7
2	**Explain** the necessity of wild life protection act.	Remember	7
3	**Explain** the necessity of various environmental legislations.	Remember	7
4	**Mention** the objectives of environmental protection act.	Analyze	6,7
5	**What** is environmental impact assessment?	Understan	6
6	**Define** Environmental Imapct Assessment and Environmental Management	Understan	6
7	**Define** sustainable development.	Understan	7
8	**What** is the role of remote sensing and GIS in EIA study.	Understan	6,7
9	**What** is meant by crazy consumerism?	Understan	7
10	**What** are the principles of sustainable cities.	Analyze	7
	Part - B (Long Answer Questions)		
1	**Write** about environmental protection Act	Apply	7
2	Disscuss the major provisions in Forest Conservation Act 1980	Evaluate	7
3	**What** are the major municipal solid waste management and	Evaluate	5,6
4	**What** are the biomedical wastes? What are the rules to manage and handle	Evaluate	5
5	**Write** a note on Impacts of air, water, biological and Socio-economical	Apply	4,5
6	**Explain** the concept of sustainable development	Analyze	7
7	**Write** a note on environmental ethics and explain concept of green	Apply	7
8	**Illustrate** Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.	Apply	7
9	**Briefly** explain the Municipal Solid Waste management	Analyze	6,7
10	**Write** a note on climate change and impacts on human	Apply	7
	Part – C (Problem Solving and Critical Thinking)		
1	**Identify** environmental education necessary in the present context? What is	Analyze	6,7
2	**Explain** are you crazy about the consumerism?	Remember	7
3	**Describe** Environmental Education and its role in the present	Remember	7
4	**What** is Urban sprawl and how is it related to human health.	Remember	7
6	**Brief** out Ecological Foot Print, Life Cycle assessment (LCA), Low	Remember	7

7	**Disscuss** the role of IT in environment	Apply	7
8	**What** are the earth centric and human centric world views	Evaluate	6,7
9	**Discuss** basic characteristics of Green buildings.	Understan	7
10	**What** is the role assigned to central pollution control board and state	Apply	7

5.9 OBJECTIVE QUESTIONS:

UNIT-I

FILL IN THE BLANKS:

1. The term ecosystem was coined by …… (Tansley)

2. The organisms who feed directly on producers are called …….. (Herbivores)

3. Chemosynthetic organisms can produce organic matter through oxidation of ……. In the absence of sunlight. (chemicals)

4. The sequence of eating and being eaten in an ecosystem is called a …….. (Food-chain)

5. Bio magnification of the pesticide …….. In the food chain resulted in the thinning of shells in birds eggs.

6. Pyramid of ……. Is always upright. (DDT)

7. Movement of nutrients in an ecosystem is cyclic while flow of energy is …….

(Uni-direction)

8. Guano deposits on the coasts of Peru are rich in the nutrient ……. (Phosphorus)

9. The inherent property of all living organisms to resist change is called …… (Homeostasis)

10. Number of individuals that a system can sustain is known as it's …….

(Carrying Capacity)

11. When respiratory loss is added to net primary production it gives ……

(Gross primary production)

12. Edaphic factors relate to …… (Soil)

CHOOSE THE CORRECT ANSWER

1. The organisms which feed on dead organisms, wastes of living organisms are called

(a) Chemotrophs (b) carnivores

(c) Detritivores (d) decomposers

2. The progressive accumulation of some non-biodegradable chemicals through the food chain is known as

(a) Ecological balance **(b) biological magnification**

(**c)** Trophic structure (d) Bio-degradation

3. Gross primary productivity is the highest in

(a) Open oceans (b) grasslands

(c) Wet tropical forests (d) agroecosystem

4. Population tends to get stabilized when the system reaches

(a) Maximum primary production (b) homeostasis

(c) Carrying capacity (d) all the above

5. As energy flows through a food-chain energy in each successive trophic level

(a) Increases **(b) decreases**

(c) Remains unchanged (d) is unpredictable

6. Dead organisms matter accumulating in an eco-system is known as

(a) Detritus (b) standing biomass

(c) Tropic structure (d) soil biomass

UNIT-2

FILL IN THE BLANKS:-

1. ……Resourses Are Inexhausible Resourses Which Can Be Generated In Given Span Of Time (Renewable)
2. …….Resourses Can Not Be Generated (Non-Renewable)
3. Plants Are …… Gas For Photosynthesis (Carbon Dioxide)

4. Maximum Number Od Dams In India Are In The …….. State (Maharastra)

5. …….. Dam Is The Highest Dam On River Bhagirathi In Uttarkhand (Theri)

6. The …….. Dam On River Saltuj In Hp Is The Largest Dam In Terms Of Capacity (Bhakhra)

7. Ecological Issues Related With Theri Dam Was Taken Up By Sh. …….. The Leader Of Chipok Movement (Sunderlal Bahuguna)

8. Environmental Activist Medha Patkar Has Tahen Up Issues Related To ……. Dam (Sardar Sarovar)

9. About ……. % Of The Earth Surface Are Covered By Water (97%)

10. Only …….. % Of Total Water On Earth Is Readily Avaliable To Us In The Form Of Ground Water And Fresh Water (0.6%)

11 A Layer Of Sediment Or Rock That Is Highly Premeable And Contains Water (Ground-Water) Is Called An …….. (Aquifer)

12 Auifers Which Are Overlaid By Premeable Earth Material And Are Recharged By Seeping Water Are Called …….. Aquifers (Un Confined)

13 Aqufires Which Are Sandwiched Between Two Impermeable Layers Of Rock Or Sediments Are Called …….. Aquifers (Confined)

14 …….. Conditions Are Created When Annual Rainfall Is Below Normal And Less Than Evaporation (Drought)

15. Uranium Mining Is Done In ……. In Ap (Nalgonda)

16. ……. Can Be Extracted From Bauxite Ore. (Aluminium)

17. Excessive Uses Of Fetilizers Cause ……. Imbalance In Soil (Nutrient)

18. Oceans Tides Are Produced By Gravitational Forces Of …… And …….

19. In India …… Details Are The Tidal Power Sutes (Sunderban)

20. For Operating Ocean Terminal Energy Coversion A Diffrence Of …….. ®C Or More Is Required Between Surface And Deeper Water Of Ocean. (20®C)

21. …….. Crops Are Latex Containing Plants Rich In Hydrocarbons (Petro)

22. Biogas Is Produced By …… Degradation (In Absense Of Oxygen) Of Biological Wastes.

23. Gasohol Is A Mixture Of ……. And ……. (Ethanol; Gasoline)

24. 95% Of Nature Gas Is ……. (Methane)

25. Nucelar Energy By Nuclear Fussion Is Generated When Certain Isotopes Are Bombarded By ……. (Neutrons)

26. Terrace Farming Is Practised As A Soil Conversion Measure In …… Areas. (Hilly)

Choose The Correct Answers: -

1. Per Capita Use Of Water Is The Highest In

(A) Usa (B) India

(C)Kuwait (D) Indonesia

2. Ground Subsidence Occurs Due To

(A) Withdrawl Of More Groundwater Than Its Recharge

(B) More Recharge Of Groundwater Than Its Withdrawl

(C) Equal Rates Of Recharge And Withdrawl

(D) None Of The Above

3. Natural Geysers Which Operate Due To Geothermal Energy Are Present In

(A) Manikaran In Kallu (B) Sohana In Haryana

(C) None Of Them **(D) Both A & B**

4. Biomass Energy Can Be Obtained From

(A) Energy Plantations

(B) Petro Crops

(C) Agricultural And Urban Waste Biomass

(D) All The Above

5. Which Of The Type Of Coal Has Maximum Carbon And Calorific Value?

(A) Anthracite (Hard Coal) (B) Bituminous (Soft Coal)

(C) Lignite (Brown Coal) (D) Wood Coal

6. Nucelar Energy Can Be Generated By

(A) Nucelar Fussion (B) Nucelar Fission

(C) Both A & B (D) None Of These

7. The Minimum Time Needed For The Foramation Of One Inch Of Top Of Soil Is

(A) 10 Years (B) 50 Years

(C) 100 Years **(D) 200 Years**

8. Minimum Disterbance Is Caused To Soil During

(A) Contour Farming **(B) Non-Till Farming**

(C) Terace Farming (D) Alley Cropping

UNIT-3

Fill In The Blanks

1. When Varitions Occurs With On A Species Due To New Combination Of Genes, This Is Called …… . Diversity (Genetic)
2. Shannon-Wiener Index Gives A Measure Of ……. Diversity (Species)
3. Drugs, Fuelwood And Food Derived From Biodiversity Represent ……. Value Of Biodiversity (Consumptive Use)
4. Quinine Is Obtained From The Bank Of …… Tree (Cinchona)
5. There Are 33 Biodiversity Hot-Spot In The World, Of Which ……. Exist In India (3)
6. Loss Of Habitat In Instalments Leading To Small Scattered Patches Is Known As ……. (Habitat Fragmentation)
7. Illegal Killing Prohibited Endangered Animals Is Called ……. (Poaching)
8. Red Data Book Giving The List Of Endangered Species Of Plants And Animals Is Published By …. …….. (Iucn)
9. Nanda Devi, Manas Are Sunderbans Are Elamples Of ……. (Biosphere Reverves)

Choose The Correct Answers

1. Which Of The Following Is Not A Hot-Spot Of Biodiversity In India Eastern ?

(A) Eastern Himalayas (B) Western Gahts

(C) Sunderbanas (D) Indo-Burma

2. Vinblastin And Vincristine , Two Anticancer Drugs Have Been Obtained From

(A) Periwinkle (B) Cinchona

(C) Bacterium (D) Jelly Fish

3. Western Ghats Are Very Rich In Endemic Species Of

(A) Birds (B) Lions

(C) Amphibians (D) Turtles

3. Which Of The Following Hot-Spot Of Biodiversity Has The Maximum Number Of Plants And Vertebrate Species

(A) Caribbean (B) Tropical Andes

(C) Madagascar (D) Indo-Burma Eastern Himalayas

5. Which Of The Following Is An Extentic Species

(A) Dugong (B) Great Indian Bustard

(C) Dodo (D) Red Panda

6. Which Of The Following Is An Eexample Of Ex-Situ Conversion

(A) Bio-Sphere Reserve **(B) Gene Bank**

(C) Sanctuary (D) All Of These

7. Kaziranga National Park Is Famous For

(A) One-Horned Rhino (B) Hangul

(C) Tiger (D) Elephant

8. There Are Only Two Sanctuaries In India Dealing With Preservation Of Plants . The Plants Are

(A) Cinchona-Orchid **(B) Citrus-Pitcher Plant**

(C) Mango-Citrus (D) Mango-Pitcher Plant

9. Cryopreservation Of Plant Seeds And Pollen Is Done At Very Low Temparature Of -196®C By Using

(A) Ice (B) Carbon Tetrachloride

(C) Liquid Nitrogen (D) Ammonia

10. Which Of The Following National Park Do Not Have Tigers As Their Main Wildlife

(A) Gir(B) Corbett

(C) Dudwa (D) Ranthambore

UNIT-4

Fill In The Blanks

1. ……. Forms The Highest Proportion In The Vehicular Exhaust (CO)

2. Sulphur Dioxide During Coal Burning Is Produced Due To Oxidation Of …… Contained In Coal (Sulfur)

3. CO Has Affinity For Hemoglobin …… Times More Than Oxygen (210)

4. Air Pollution Affects Plants By Entering Through …….. (Stomata)

5. Sound Frequency Is Expressed In ……. (Hertz (Hz))

6. Noise Levels Considered As Threshold Of Pain Are …… Db (140)

7. Minamata Disease Occurred Due To Consumption Of Fish Contaminated With…….. (Methyl Mercury)

8. Blue Baby Syndrome Is Caused By The Presence Of …… In Drinking Water (Nitrate)

9. Nitrate Concentrations Exceeding 25 Mg/L In Water Cause The Health Hazard Called ……..
(Blue Baby Syndrome)

10. Biological Treatment Of Water Waste Is Called …… Treatment. (Secondary)

11. Nutrients Nitrate And Phosphates Cause ……. In Water Bodies. (Eutrophication)

12. For Active Fish Species, D.O. In Water Should Range From ……. To ……. Mg/L (5 To 8)

13. Electroplating Industry Effluents Contain …….. Metals (Heavy)

14. Radioactive Strontium Deposits In The …… (Bones)

CHOOSE THE CORRECT ANSWERS:

1. Damage Of Leaf Structure By Air Pollutants Causes

(A) Dead Areas Of Leaf (B) Chlorophyll Reduction

(C) Dropping Of Leaf **(D) All The Above**

2. Air Pollutants Mixing Up With Rain Can Cause

(A) High Acidity (B) Low Acidity

(C) Neutrals Conditions (D) None Of These

3. Industrial Wastes May Contain Toxic

(A) Chemicals (B) Phenols

(C) Acids **(D) All Of These**

4. Dissolved Oxygen In Water Comes From

(A) Photosynthesis Of Aquatic Plants (B) Atmosphere

(C) None Of These **(D) Both A & B**

5. Itai Itai Disease In Japan Was Caused By Consumption Of Rice Contaminated With

(A) Mercury (B) Iron

(C) Cadmium (D) Zinc

6. Thermal Pollution Can Be Controlled By

(A) Cooling Ponds (B) Spray Ponds

(C) Cooling Towers **(D) All The Above**

7. Over Irrigation Without Proper Drainage Leads To

(A) Water Logging (B) Salinization

(C) Both A & B (D) None Of These

8. Act With Prohibits Dumping Of Hazardous Waste In Ocean Is

(A) Clean Water Act (B) Water Act

(C) Ocean Dumping Act (D) Clean Sea Act

9. How Much Energy Provided By Fossil Fuel For Operation Of Power Plants Is Utilized And Rest Is Lost In The Form Of Heat

(A) 1/6 **(B) 1/3**

(C) 1/10 (D) 1/2

10. Oil In Water Affects Fish By Affecting

(A) Gills (B) Scales

(C) Eyes **(D) None Of These**

11. Which Of The Following Have More Penetration Power

(A) Alpha Particles (B) Beta Particles

(C) Gamma-Rays (D) None Of These

FILL IN THE BLANKS

1. Average Global Temperature Is 15®C. In The Absence Of Greenhouse Gasses The Temperature Would Have Been …… (-18®C)

2. Ozone Layer Acts As Natural Sunscreen Which Protects Life On Earth Against …….. Rays (UV)

3. Ozone Concentration Is Measured In …… Units (Dobson)

4. Ozone Depleting Nature Of CFC's Was First Reported By …….. And …….. (Rowland And Molina)

5. Deforestation Means …….. Of Forests (Degradation)

6. ……. % Of Geographical Area Of The Country Should Be Forest Area (33%)

7. Montreal Protocol Called For A Freeze On The Use Of …….. (CFC's)

8. Earth Summit Was Held In 1992 At …….. And In 2002 At …… (Rio De Janerio & Johannesburg)

Choose The Correct Answer

1. Which Of The Following Gasses Has Maximum Contribution To Enhanced Greenhouse Effect

(A) CFC's (B) Ch4

(C) Co2 (D) N2o

2. Cattle, Sheep And Termites Are Responsible For The Release Of The Following Greenhouse Gasses

(A) Methane (B) Carbon Dioxide

(C) Nitrous Oxide (D) All The Above

3. The Most Important Agents For Ozone Depletion Are

(A) Methane (B) CFC's

(C) Nuclear Fallout (D) Nitrous Oxide

4. Maximum Depletion Of Ozone Occurs On

(A) Equator (B) North Pole

(C) South Pole (D) Tropics

5.Deforestation Rate Is Alarming In

(A) Temperate Countries (B) Fuel Requirements

(C) Polar Region (D) None Of These

6. Major Causes Of Deforestation Are

(A) Shifting Cultivation (B) Fuel Requirements

(C) Raw Material For Industries (D) All Of These

7. Over Grazing Results In

(A) Productive Soil (B) Soil Erosion

(C) Retention Of Useful Species (D) All Of These

8. UVB Radiations Which Reach Earth Can Cause

(A) Skin Cancer (B) Cataract

(C) Suppression In Immune System (D) All The Above

UNIT-5

Fill In The Blanks

1. EIA Gazette Notification In India Was Done Under Environment (Protection) Act In The Year …… ….. And Amended In…….. (1994; 2006)
2. Whether A Project Needs An EIA Clearance Or Not Is Decided During …… (Screening)
3. CRZ Stands For…… (Coastal Regulatory Zone)
4. The EIA Report Based On A Single Season Data (Other Than Mansoon Period) Is Called …… … (Rapid EIA)
5. A Technique Or Recharge Groundwater By Capturing And Storing Rainwater Is Known As …… (Rainwater Harvesting)
6. The Person From Rajasthan Who Has Been Awarded Magsaysay Award For His Work On Rain-Water Harvesting, Who Is Popularly Called “Water Man” Is ……. (Rajendra Singh)

Choose The Correct Answer

1. Gazette Notification On EIA Is Issued By

(A) Ministry Of Human Resource Development

(B) Ministry Of Environment And Forest

(C) Ministry Of Finance

(D) Ministry Of Urban Development

2. EIH Helps To

(A) Achieve Sustainable Development

(B) Reap Environmental Benefits Without Its Degradation

(C) Maintain Balance Between Pollution And Resources

(D) All The Above

3. One Example Of Irreversible Impact Is

(A) Deforestation Of Land **(B) Loss Of An Endangered Spices**

(C) Change In Landscape (D) Loss Of Soil Fertility

4. Which Of The Following Sequence In EIA Are In Correct Order

(A) Scoping-Prediction-Identification-Evaluation

(B) Screening- Scoping-Identification-Prediction

(C) Scoping-Evaluation-Prediction-Mitigation

(D)) Screening-Scoping-Mitigation-Evaluation

5. Study Of Various Atmospheric Parameters Are Included In

(A) Geology (B) Hydrology

(C) Meteorology (D) Ecology

6. Rainwater Harvesting Helps In

(A) Reduce Run-Off (B) Groundwater Recharge

(C) Reduce Water Pollution **(D) All Of These**

Fill In The Blanks

1. The First Country In The World To Make Constitutional Provisions For Environmental Protection Is ……
(India)

2. Noise Pollution Was Included As Pollution In The Air (Prevention And Control Of Pollution) Act In The Year …….. (1987)

3. Aggrieved Industries On Being Rejected Consent By The Pollution Control Board Can File An Appeal To ……. Authority For Redressal (Appellate)

4. Environment Protection Act Came Into Force In The Year …….. On Birth Anniversary Of Smt. Indira Gandhi (1986)

4. Packing, Labeling And Handling Hazardous Waste Is Done Strictly Following The Guidelines Issued By …… Under The Hazardous Material (Management, Handling And Transboundary Movement)

Rules. (Central Pollution Control Board)

6. National Environment Policy Was Formulated In The Year ……. Based On Several Other Policies. (2006)

CHOOSE THE CORRECT ANSWER

1. Which Article In The Constitution Recognizes Environmental Protection As One Of The Fundamental Duties Of Every Citizen Of India

(A) Article 42 (B) Article 48A

(C) Article 51 A(G) (D) Article 52

2. As Per The Forest Act, Cultivation Of Which Of The Following Is A Non-Forest Activity

(A) Tea (B) Rubber

(C) Mulberry **(D) All The Above**

3. Which Of The Following Is Not A Characteristic Of A Hazardous Substance

(A) Corrosive (B) Explosive

(C) Carcinogenic **(D) Allergic**

4. Which Of The Following Rules Were Farmed Under Environment(Protection) Act

(A) Environment (Protection) Rules

(B) Bio Medical Waste Management And Handling Rules

(C) Hazardous Material (Management And Handling Rules)

(D) All The Above

5. Which Act Is Known As "Umbrella Act"

(A) Water (Prevention And Control Of Pollution) Act , 1974

(B) Air(Prevention And Control Of Pollution) Act, 1981

(C) Environmental (Protection Act) , 1986

(D) Forest Conservation Act, 1980

FILL IN THE BLANKS

1. The Term 'Sustainable Development' Was Given And Defined By …… (G.H.Brundtland)

2. The Earth Summit Was Held At …….. And The UN World Summit On Sustainable Development (WSSD) Was Held In …… (Rio De Janeiro, Brazil; Johannesburg, South Africa)

3. …….. Is The Capacity To Tolerate Different Stresses .(Assimilative Capacity)

4. Expanding Population Is Predicted When The Age Pyramid Is…….. Shaped And A Declining Population Is Predicted When It …… Shaped. (Pyramid Shaped, Urn Shaped)

5. If A Nation Has 2% Annual Growth Rate , Its Population Will Double In …….. Years. (35years)

6. Environmental Is Made Available To Design Makers, Researchers And Scientists Through A Government Network System Called …… (Environmental Information System, ENVIS)

7. For Reduction Of Emissions Through CDM Projects Saleable Credits Can Be Earned , Which Is Known As …….. (CER: Certified Emission Reduction)

8. Haphazard Growth Of Urban Settlements In Outer Boundary Of Cities Is Known As …… (Urban Sprawl)

9 The 3-R Approach Of Resource Use Stands For …… ,……. And …… (Reduce, Reuse, Recycle)

Choose The Correct Answer

1. UN Conference On Environment And Development Is Popularly Known As

(A) Montreal Protocol (B) Kyoto Protocol

(C) Earth Summit (D) Basel Conversion

2. Capacity Of A System To A Sustain A Maximum Number Of Organisms In A Long Term Basis Is Known As

(A) Carrying Capacity (B) Buffering Capacity

(C) Regenerating Capacity (D) Assimilating Capacity

3. The Present World Population Has Crossed

(A) 4 Billion (B) 5 Billion

(C) 6 Billion (D) 7 Billion

4. Stable Population Trend Is Predicted When Age Pyramid Is

(A) Bell Shaped (B) Pyramid Shaped

(C) Urn Shaped (D) None Of These

5. Every ……. Person In This World Is Indian

(A) 5^{th} **(B) 6^{th}**

(C) 7^{th} (D) 8^{th}

6. Which State In India Has Lowest Birth Rate

(A) J&K **(B) Kerala**

(C) H.P (D) Bihar

7. Chemicals That Cause Abnormalities During Embryonic Growth And Development Are Known As

(A) Carcinogenic (B) Mutagenic

(C) Allergenic **(D) Teratogenic**

8. Rating Of Green Building Is Done By

(A) CPCB **(B) GIRHA**

(C) NEERI (D) Moef

NETWORK ANALYSIS:

PROGRAMME: B.Tech ECE AC:YEAR: **2018-2019**	DEGREE: **B.TECH II YEAR**
COURSE: **NETWORK ANALYSIS**	SEMESTER: **I** CREDITS: 4 COURSE COORDINATOR: KIRAN KUMAR
COURSE CODE: **EC305ES** REGULATION:**R16**	COURSE TYPE: **core**
COURSE AREA/DOMAIN: ECE	CONTACT HOURS: 4 hours/Week.
CORRESPONDING LAB COURSE CODE : NILL	LAB COURSE NAME: NILL

6.1 COURSE OVERVIEW:

A network, in the context of electronics, is a collection of interconnected components. Network analysis is the process of finding the voltages across, and the currents through, every component in the network. There are many different techniques for calculating these values. However, for the most part, the applied technics assumes that the components of the network are all linear. The methods described in this article are only applicable to linear network analysis, except where explicitly stated.

6.2 PREREQUISITES, IF ANY :

- Basic Electrical and Electronics Engineering
- Laplace Transforms
- Differential Equations

6.3 MARKS DISTRIBUTION:

Session Marks	University End Exam Marks	Total Marks
There shall be two mid tem examinations. Each Mid-term exam consists of subjective type and objective type test. The subjective test is for 10 marks, with duration of 1 hour Subjective test of each semester shall contain four questions; the student has to answer two out of them. Each carrying 5 marks The objective test paper Is prepared by JNTUH, which consists of 20 questions each carrying 0.5 marks and total of 10 marks. The student is assessed by giving two assignments, one, after completion of 1to 2 1/2 units and the second, after the completion of 2 1/2 to 5 units each carrying 5 marks. On the total the internal marks are 25. The average of two internal tests is the final internal marks. The external question paper is set by JNTUH consisting of part –A and part- B. Where part consists of short answer questions carrying total marks of 25 and part part-B consists of 5 essay type questions consists of internal choice each carrying 10 marks and the total of 50. The total external marks are 75.awarded considering the average of two assignments in each course	75	100

6.4 VALUATION SCHEME:

S.No	Component	Total Duration	Marks
1.	I Mid Examination	90 Minutes	20
2.	I Assignment	----	05
3.	II Mid Examination	90 Minutes	20
4.	II Assignment	------	05
5.	External Examination	3 hours	75

6.5 COURSE OBJECTIVES:

To understand the basic concepts on RLC circuits.

To know the behavior of the steady states and transients states in RLC circuits.

To know the basic Laplace transforms techniques in periods waveforms.

To understand the two port network parameters.

To understand the properties of LC networks and filters.

COURSE OUTCOMES:

On completion of this subject, the student should be able to

1. Gains the knowledge on Basic network elements.

2. Learns and analyze the RLC circuits' behavior in detail.

3.Analyze the performance of periodic waveforms.

4. Learns and gain the knowledge in characteristics of two port network parameters (Z,Y, ABCD, h & g)

To analyze the filter design concepts in real world applications.

COURSE OBJECTIVES:

To understand the basic concepts on RLC circuits.

To know the behavior of the steady states and transients states in RLC circuits.

To know the basic Laplace transforms techniques in periods waveforms.

To understand the two port network parameters.

Gains the knowledge on Basic network elements.

Learns and analyze the RLC circuits' behavior in detail.

Analyze the performance of periodic waveforms.

Learns and gain the knowledge in characteristics of two port network parameters

To analyze the filter design concepts in real world applications.

6.6 JNTUH SYLLABUS:

UNIT – I

Review of R, L,C, RC, RL, RLC circuits, Network Topology, Terminology, Basic cutest and tie set matrices for planar networks, Illustrative Problems, Magnetic Circuits, Self and Mutual inductances, dot convention, impedance, reactance concept, Impedance transformation and coupled circuits, co-efficient of coupling, equivalent T for Magnetically coupled circuits, Ideal Transformer.

UNIT – II

Steady state and transient analysis of RC, RL and RLC Circuits, Circuits with switches, step response, 2nd order series and parallel RLC Circuits, Root locus, damping factor, over damped, under damped, critically damped cases, quality factor and bandwidth for series and parallel resonance, resonance curves

UNIT – III

Network Analysis using Laplace transform techniques, step, impulse and exponential excitation, response due to periodic excitation, RMS and average value of periodic waveforms.

UNIT – IV

Two port network parameters, Z, Y, ABCD, h and g parameters, Characteristic impedance, Image transfer constant, image and iterative impedance, network function, driving point and transfer functions – using transformed (S) variables, Poles and Zeros.

UNIT – V

L Sections, Characteristic impedance, image transfer constants, Design ofπStandard T, Conversion, LC Networks and Filters: Properties of LC Networks, Foster's Reactance theorem, design of constant K, LP, HP and BP Filters, Composite filter design.πAttenuators, impedance matching network, T and .

TEXT BOOKS:

- Network Analysis – ME Van Valkenburg, Prentice Hall of India, 3rd Edition, 2000.
- Networks, Lines and Fields – JD Ryder, PHI, 2nd Edition, 1999.

REFERENCES:

- Engineering Circuit Analysis – William Hayt and Jack E Kemmerly, MGH, 5th Edition, 1993.
- Electric Circuits – J. Administer and M.Nahvi – Schaum's Outlines,
- Network Theory – Sudarshan and Shyam Mohan, Mc Graw Hill Education.

6.7 COURSE PLAN:

LESSON PLAN

Department: EEE **Academic Year : 2018-19**
Name of Faculty : S KIRAN KUMAR **Year-Semester: II -I Sem**

SUBJECT: NETWORK ANALYSYS

s.no	Unit no	Topic	Week	No of sessions planned	Mode of teaching BB/PPT/OHP/MM	Reference *	Remarks
1	I	**Review of R, L,C, RC, RL, RLC circuits**			BB	A3/A4	
2		Network Topology,Terminology	1	1	BB	A3/A4	
3		Basic cutest and tie set matrices for planar networks	1	1	BB	A3/A4	
4		Problems	2	2	BB	A3/A4	
5		Magnetic Circuits, Self and Mutual	2	2	BB	A3/A4	

		inductances, dot convention					
6		Impedance, reactance concept	3	2	BB	A3/A4	
7		Impedance transformation and coupled circuits, co-efficient of coupling,	3	2	BB	A3/A4	
8		Loop and Nodal Analysys, Duality & Dual Networks	3	2	BB	A3/A4	
9		Equivalent T for Magnetically coupled circuits, Ideal Transformer.	3	1	BB	A3/A4	
15		**Steady state and transient analysis of RC, RL and RLC Circuits**			BB	A3/A4	
16		Circuits with switches, step response	5	3	BB	A3/A4	
17		second order series and parallel RLC Circuits	5	3	BB	A3/A4	
18		Root locus, damping factor, over damped,under damped, critically damped cases	5	3	BB	A3/A4	
19		quality factor and bandwidth for series andparallel resonance, resonance curves	6	4	BB	A3/A4	
20	**II**	**Network Analysis using Laplace transform techniques**			BB	A3/A4	
21		step, impulse and exponential excitation.	7	4	BB	A3/A4	
22		response due to periodic excitation	7	4	BB	A3/A4	
23	**III**	RMS and average value of periodic waveforms. PROBLEMS	8	5	BB	A3/A4	
24	**IV**	**Two port network parameters, Netwok Functions**			BB	A3/A4	

25		Z, Y, ABCD, h and g parameters	9	5	BB	A3/A4	
26		Characteristic impedance	10	2	BB	A3/A4	
27		Image transfer constant, image and iterative impedence	10	2	BB	A3/A4	
28		network function, driving point and transfer functions – using transformed (S) variables, Poles and Zeros.	11	4	BB	A3/A4	
29	V	**Standard T, π, L Sections**			BB	A3/A4	
30		Characteristic impedance, image transfer constants	13	2	BB	A3/A4	
31		Design of Attenuators, impedance matching network	13	1	BB	A3/A4	
32		T and π Conversion	14	1	BB	A3/A4	
33		LC Networks and Filters:Properties of LC Networks	14	2	BB	A3/A4	
34		Foster's Reactance theorem	15	2	BB	A3/A4	
35		design of constant K, LP, HP and BP filters	15	2	PPT	A3/A4	
36		Composite filter design.	15	2	BB	A3/A4	

Text Books **A1 - A10**

Websites or e-books **B1 - B10**

BB	Black Board
PPT	Power Point Presentation
OHP	Over Head Projector
MM	Multimedia (Audio - Vedio)

Text Books:

A1	Network Analysis – ME Van Valkenburg, Prentice Hall of India, 3rd Edition, 2000.
A2	Networks, Lines and Fields - JD Ryder, PHI, 2nd Edition, 1999.
A3	Network Theory – Sudarshan and Shyam Mohan, Mc Graw Hill Education.
A4	Network Theory-Chakrabarty..

6.7MAPPING COURSE OBJECTIVES LEADING TO THE ACHIEVEMENT OF THE PROGRAM OUTCOMES:

Course Objective	**Course Outcomes**				
	a	**b**	**c**	**d**	**e**
I	S				
II	S	S			
III			H		
IV				H	S
V					S

6.8 MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF THE PROGRAM OUTCOMES:

PROGRAMME OUTCOMES:

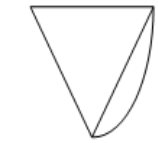
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PO-9**	**PO-10**	**PO-11**	**PO-12**
1	√	√	√		√			√			√	
2	√	√	√		√			√			√	
3	√	√	√		√			√			√	
4	√	√	√		√			√			√	
5	√	√	√		√			√			√	

	PSO-1	PSO-2
1	√	√
2	√	√
3	√	√
4	√	√
5	√	√

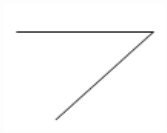
6.9 QUESTION BANK:

Graph theory

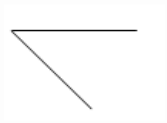
This set of Network Theory Multiple Choice Questions & Answers (MCQs) focuses on "Tree and Co-Tree".

1. A graph is said to be a directed graph if _____ of the graph has direction.
a) 1 branch
b) 2 branches
c) 3 branches
d) every branch
2. The number of branches incident at the node of a graph is called?
a) degree of the node
b) order of the node
c) status of the node
d) number of the node
3. If no two branches of the graph cross each other, then the graph is called?
a) directed graph
b) undirected graph
c) planar graph
d) non-planar graph
4. Consider the  graph given below. Which of the following is a not a tree to the graph?

a)



b)



c)

d)

.

Answer: d

Explanation: Tree is sub graph which consists of all node of original graph but no closed paths. So, ‘d’ is not a tree to the graph.

5. Number of twigs in a tree are? n- number of nodes

a) n

b) n+1

c) n-1

d) n-2

.

6. Loops which contain only one link are independent are called?

a) open loops

b) closed loops

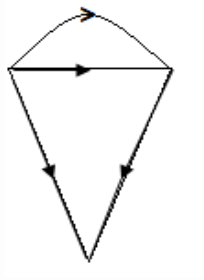
c) basic loops

d) none of the above

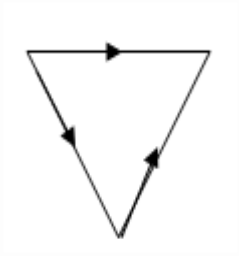
7. If the incident matrix of a graph is given below. The corresponding graph is?

	a	b	c	d	e	f
1	+1	0	+1	0	0	+1
2	-1	-1	0	+1	0	0
3	0	+1	0	0	+1	-1
4	0	0	-1	-1	-1	0

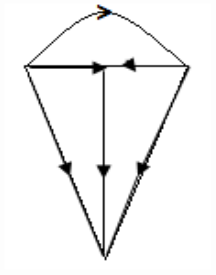
a)



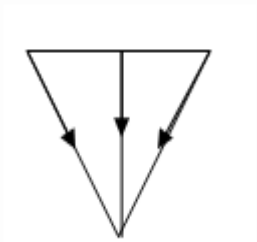
c)



b)



d)



8. If A represents incidence matrix, I represents branch current vectors, then?
a) AI = 1
b) AI = 0
c) AI = 2
d) AI= 3
9. If a graph consists of 5 nodes, then the number of twigs in the tree are?
a) 1
b) 2
c) 3
d) 4
.

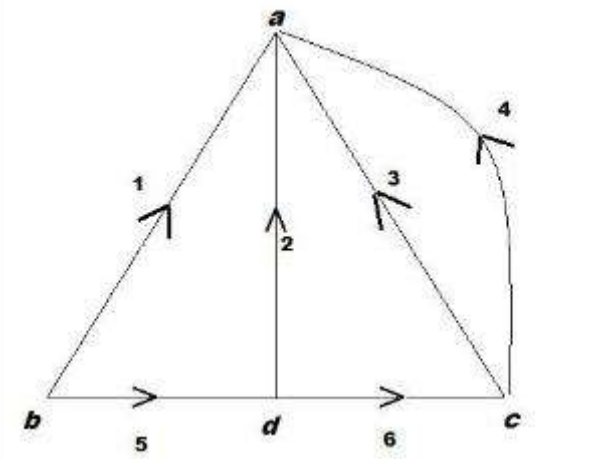
10. If there are 4 branches, 3 nodes then number of links in a co-tree are?
a) 2
b) 4
c) 6
d) 8
This set of Network Theory Multiple Choice Questions & Answers (MCQs) focuses on “Link Currents:

Tie-Set Matrix”.

1. The current in a closed path in a loop is called?
a) loop current
b) branch current
c) link current
d) twig current
2. Tie-set is also called?
a) f loop
b) g loop
c) d loop

d) e loop

3. Consider the graph shown below. If a tree of the graph has branches 4, 5, 6, then one of the twigs will be?



a) 1
b) 2
c) 3
d) 4

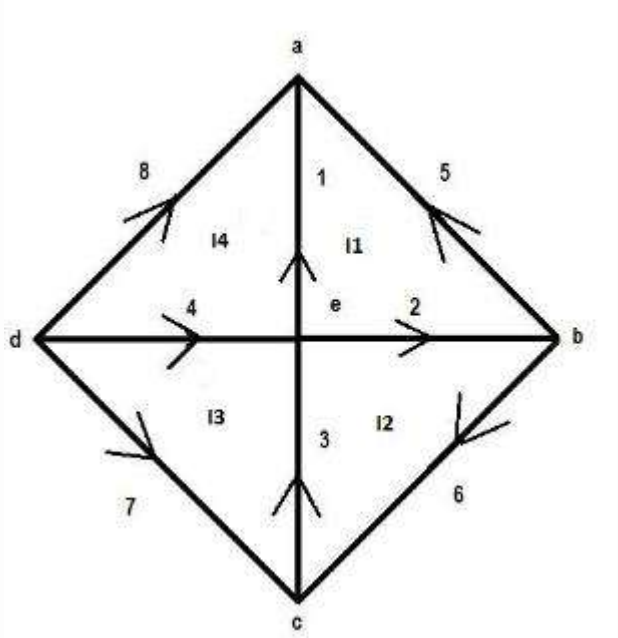
4. Consider the graph shown in the question 3 above. If a tree of the graph has branches 4, 5, 6, then one of the links will be?

a) 3
b) 4
c) 5
d) 6

5. The loop current direction of the basic loop formed from the tree of the graph is?

a) same as the direction of the branch current
b) opposite to the direction of the link current
c) same as the direction of the link current
d) opposite to the direction of the branch current

.6. Consider the graph shown below. The direction of the loop currents will be? (ACW – Anticlockwise, CW – Clockwise).



a) I_1 ACW
b) I_2 ACW

c) I_3 CW
d) I_4 ACW
.

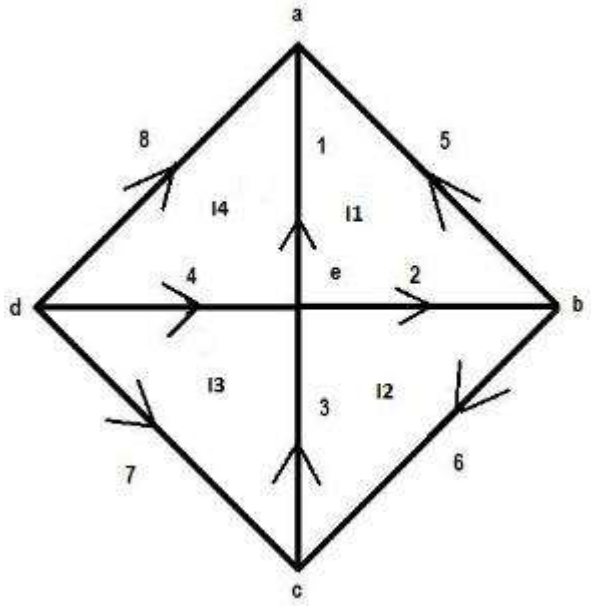
7. For Tie-set matrix, if the direction of current is same as loop current, then we place ___ in the matrix.
a) +1
b) -1
c) 0
d) +1 or -1
8. If a row of the tie set matrix is as given below, then its corresponding equation will be?
1 2 3 4 5 6 7 8
I_1 -1 +1 0 0 +1 0 0 0
a) $-V_1+V_2+V_3=0$
b) $-I_1+I_2+I_3=0$
c) $-V_1+V_2-V_3=0$
d) $-I_1+I_2-I_3=0$
9. The matrix formed by link branches of a tie set matrix is?
a) Row matrix
b) Column matrix
c) Diagonal matrix
d) Identity matrix
10. The number of tie set matrices formed from a graph are?
a) N^{N-1}
b) N^N
c) N^{N-2}
d) N^{N+1}

Network Theory Questions and Answers – Cut-Set and Tree Branch Voltages

This set of Network Theory Interview Questions and Answers focuses on “Cut-Set and Tree Branch Voltages”.

1. The direction of the cut-set is?
a) same as the direction of the branch current
b) opposite to the direction of the link current
c) same as the direction of the link current
d) opposite to the direction of the branch current
.

2. Consider the graph shown below. The direction of the cut-set of node ‘a’ is?



a) right
b) left
c) upwards
d) downwards

3. Consider the graph shown above in question 2. The direction of the cut-set at node ‘b’ will be?
a) upwards
b) right
c) downwards
d) left

4. In the graph shown above in the question 2, the direction of the cut-set at node ‘c’ is?
a) downwards
b) upwards
c) left
d) right

5. In the graph shown in the question 2, the direction of the cut-set at node ‘d’ will be?
a) left
b) downwards
c) right
d) upwards

.

6. The row formed at node ‘a’ in the cut set matrix in the figure shown in question 2 is?
I_1 I_2 I_3 I_4 I_5 I_6 I_7 I_8
a) +1 +1 +1 +1 0 0 0 0
b) +1 0 0 0 +1 0 0 +1
c) -1 0 0 0 -1 0 0 -1
d) -1 -1 0 0 -1 -1 0 0

7. The row formed at node ‘c’ in the cut set matrix in the figure shown question 2 is?
a) -1 -1 0 0 +1 -1 0 0

b) 0 0 +1 0 0 -1 -1 0
c) +1 0 0 0 +1 0 0 +1
d) -1 0 0 0 -1 0 0 -1
8. The number of cut set matrices formed from a graph is?
a) N^{N-1}
b) N^{N}
c) N^{N-2}
d) N^{N+1}
9. For every tree there will be _____ number of cut set matrices.
a) 1
b) 2
c) 3
d) 4
10. If a row of the cut set matrix formed by the branch currents of the graph is shown below. Then which of the following is true?

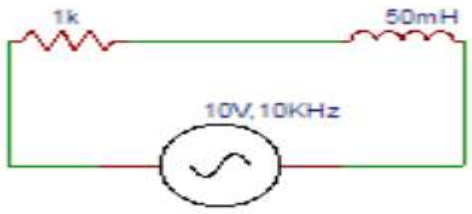
I_1	I_2	I_3	I_4	I_5	I_6	I_7	I_8
-1	-1	0	0	+1	-1	0	0

a) $-V_1-V_2+V_5-V_6=0$
b) $-I_1-I_2+I_5-I_6=0$
c) $-V_1+V_2+V_5-V_6=0$
d) $-I_1+I_2+I_5-I_6=0$

6.10 OBJECTIVE QUESTIONS:

This set of Network Theory Multiple Choice Questions & Answers (MCQs) focuses on "Series Circuits".

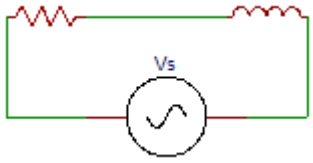
1. If we apply a sinusoidal input to RL circuit, the current in the circuit is _____ and the voltage across the elements is _____
   a) square, square
   b) square, sinusoid
   c) sinusoid, square
   d) sinusoid, sinusoid
2. The circuit shown below consists of a 1kΩ resistor connected in series with a 50mH coil, a 10V rms, 10 KHz signal is applied. Find impedance Z in rectangular form.



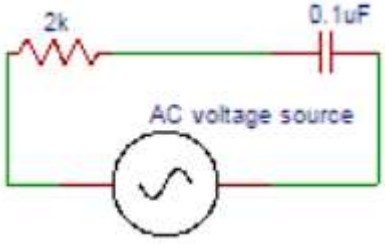
   a) (1000+j0.05) Ω
   b) (100+j0.5) Ω
   c) (1000+j3140) Ω
   d) (100+j3140) Ω
3. Find the current I (mA) in the circuit shown above.
   a) 3.03
   b) 30.3

c) 303
d) 0.303
4. Find the phase angle θ in the circuit shown above.
a) 62.33^0
b) 72.33^0
c) 82.33^0
d) 92.33^0
5. In the circuit shown above find the voltage across resistance.
a) 0.303
b) 303
c) 3.03
d) 30.3
6. In the circuit shown above find voltage across inductive reactance.
a) 9.5
b) 10
c) 9
d) 10.5

7. Determine the source voltage if voltage across resistance is 70V and the voltage across inductor is 20V as shown in the figure.



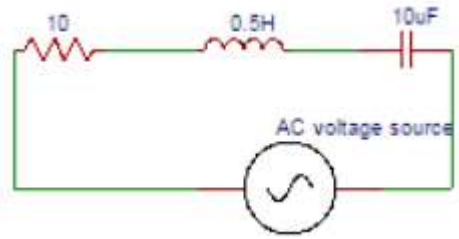
a) 71
b) 72
c) 73
d) 74
8. Find the phase angle in the circuit shown above.
a) 15
b) 16
c) 17
d) 18
9. An AC voltage source supplies a 500Hz, 10V rms signal to a 2kΩ resistor in series with a 0.1μF capacitor as shown in figure. Find the total impedance.



a) 3750.6Ω
b) 3760.6Ω
c) 3780.6Ω
d) 3790.6Ω
10. Determine the phase angle in the circuit shown above.
a) 58
b) 68

c) -58
d) -68
11. Find the current I (mA) in the circuit shown above.
a) 2.66
b) 3.66
c) 4.66
d) 5.66
12. Find the voltage across the capacitor in the circuit shown above.
a) 7
b) 7.5
c) 8
d) 8.5
13. Determine the voltage across the resistor in the circuit shown above.
a) 3
b) 4
c) 5
d) 6

14. In the circuit shown below determine the total impedance.



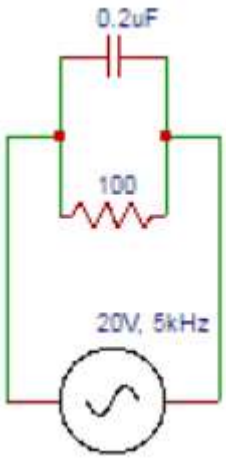
a) 161
b) 162
c) 163
d) 164
15. Find the current in the circuit shown above.
a) 0.1
b) 0.2
c) 0.3
d) 0.4

NETWORK THEORY QUESTIONS AND ANSWERS – PARALLEL CIRCUITS:

This set of Network Theory Multiple Choice Questions & Answers (MCQs) focuses on "Parallel Circuits".

1.A signal generator supplies a sine wave of 20V, 5 kHz to the circuit as shown. Determine total

current IT.



a) $0.21\angle 33^0$
b) $0.22\angle 33^0$
c) $0.23\angle 33^0$
d) $0.24\angle 33^0$

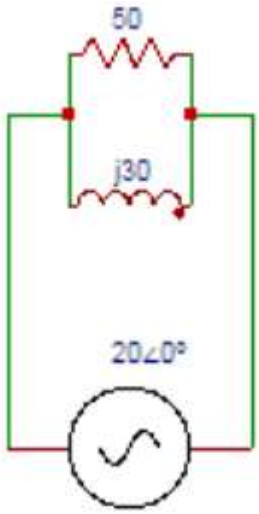
2. Find the phase angle in the circuit shown above.

a) 31^0
b) 32^0
c) 33^0
d) 34^0

3. Determine the total impedance in the circuit.

a) $73.3\angle 33^0$
b) $83.3\angle -33^0$
c) $83.3\angle 33^0$
d) $73.3\angle -33^0$

4. A 50Ω resistor is connected in parallel with an inductive reactance of 30Ω. A 20V signal is applied to the circuit. Find the line current in the circuit.



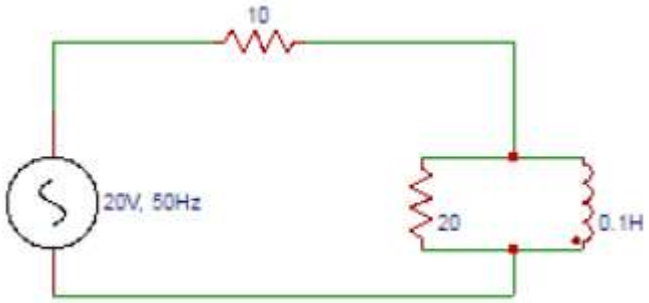
a) $0.77\angle -58.8^0$
b) $0.77\angle 58.8^0$
c) $0.88\angle -58.8^0$
d) $0.88\angle 58.8^0$

5. Determine total impedance in the circuit shown above.

a) $25\angle -58.8^0$

b) $25\angle -58.8^0$.
c) $26\angle -58.8^0$.
d) $26\angle 58.8^0$.

6. Determine Z in the figure shown below.

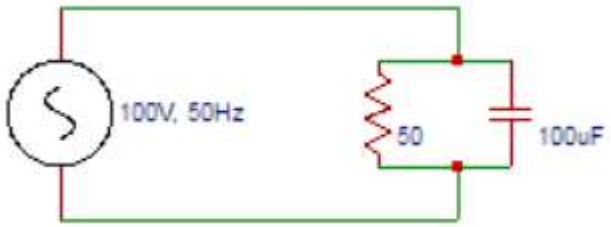


a) $26\angle -20.5^0$
b) $26\angle 20.5^0$
c) $25\angle -20.5^0$
d) $25\angle 20.5^0$

7. Find I_T in the figure shown above.
a) $0.66\angle -20.5^0$
b) $0.66\angle 20.5^0$
c) $0.77\angle 20.5^0$
d) $0.77\angle -20.5^0$

8. Find the phase angle θ in the circuit shown above.
a) 20.5^0
b) 20^0
c) 19.5^0
d) 19^0

9. Find the impedance in the circuit shown below.



a) 25
b) 26
c) 27
d) 28

10. Determine the phase angle in the circuit shown above.
a) 56^0
b) 56.5^0
c) 57.5^0
d) 57^0

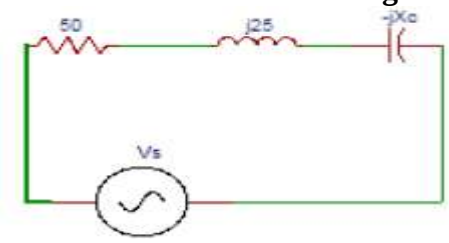
Multiple Choice Questions & Answers (MCQs) focuses on "Series Resonance".

1. The circuit is said to be in resonance if the current is ____ with the applied voltage.
a) in phase
b) out of phase
c) 45^0 out of phase

d) 90^0 out of phase
2. In a series resonance circuit, series resonance occurs when?
a) $X_L = 1$
b) $X_C = 1$
c) $X_L = X_C$
d) $X_L = -X_C$
.

3. As $X_L = X_C$ in a series resonance circuit, the impedance is_____
a) purely capacitive
b) purely inductive
c) purely resistive
d) capacitive and inductive
4. At resonant frequency, the voltage across capacitor is _____ the voltage across inductor.
a) greater than
b) less than
c) greater than or equal to
d) equal to
5. In series RLC circuit, the voltage across capacitor and inductor are _____ with each other.
a) in phase
b) 180^0 out of phase
c) 90^0 out of phase
d) 45^0 out of phase
6. The voltage across the LC combination in a series RLC circuit is?
a) 0
b) 1
c) 2
d) 3

7. The expression of resonant frequency in a series resonant circuit is?
a) $1/(2\pi\sqrt{C})$
b) $1/(2\pi\sqrt{L})$
c) $2\pi\sqrt{LC}$
d) $1/(2\pi\sqrt{LC})$
8. For the circuit shown in figure determine the capacitive reactance at resonance.

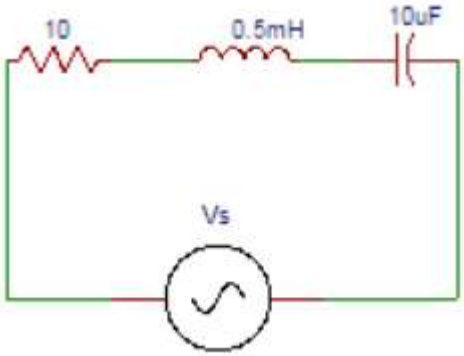


a) 15
b) 20
c) 25
d) 30

9. The value of the impedance at resonance in the circuit shown in the question 9 is?
a) 25
b) 50
c) 75

d) 100

10. Determine the resonant frequency (kHz) for the circuit shown below.



a) 2.25
b) 22.5
c) 225
d) 2250

Network Theory Questions and Answers – Parallel Resonance

This set of Network Theory Multiple Choice Questions & Answers (MCQs) focuses on “Parallel Resonance”.

1. For the circuit shown below, determine its resonant frequency.

a) 6.12
b) 7.12
c) 8.12
d) 9.12

2. Find the quality factor of the circuit shown in the question 1.
a) 2.24
b) 3.34
c) 4.44
d) 5.54

3. Find the bandwidth of the circuit shown in the question 1.
a) 1
b) 2
c) 3
d) 4

4. The magnification in resonance considering the voltage across inductor is?

a) V/V_L
b) V_L/V
c) $V \times V_L$
d) V_L

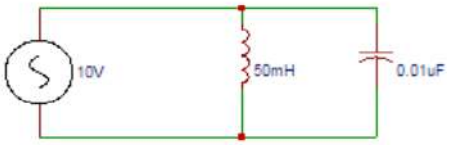
5. Considering the voltage across the capacitor, the magnification in resonance is?
a) V_C
b) $V \times V_C$
c) V_C/V
d) V/V_C

6. The value of ω_r in parallel resonant circuit is?

a) $1/(2\sqrt{LC})$
b) $1/\sqrt{LC}$
c) $1/(\pi\sqrt{LC})$
d) $1/(2\pi\sqrt{LC})$

7. The expression of resonant frequency for parallel resonant circuit is?
a) $1/(2\pi\sqrt{LC})$
b) $1/(\pi\sqrt{LC})$
c) $1/(2\sqrt{LC})$
d) $1/\sqrt{LC}$

8. Find the resonant frequency in the ideal parallel LC circuit shown in the figure.



a) 7.118
b) 71.18
c) 711.8
d) 7118

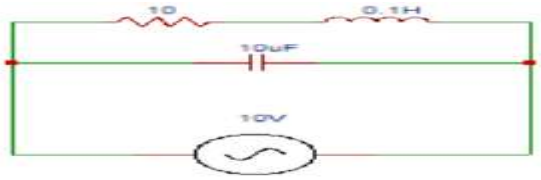
9. If the value of Q of the circuit is high, then its effect on bandwidth is?
a) large bandwidth
b) small bandwidth
c) no effect on bandwidth
d) first increases and then decreases

10. If in a circuit, if Q value is decreased then it will cause?
a) small bandwidth
b) no effect on bandwidth
c) first increases and then decreases
d) large bandwidth

NETWORK THEORY QUESTIONS AND ANSWERS – RESONANT FREQUENCY FOR A TANK CIRCUIT:

This set of Network Theory Multiple Choice Questions & Answers (MCQs) focuses on "Resonant Frequency for a Tank Circuit".

1. For the tank circuit shown below, find the resonant frequency.

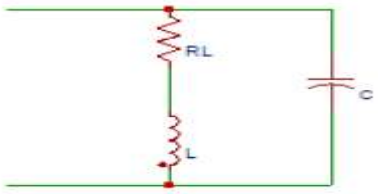


a) 157.35
b) 158.35
c) 159.35
d) 160.35
.

2. The expression of ωr in parallel resonant circuit is?
a) $1/(2\sqrt{LC})$
b) $1/\sqrt{LC}$
c) $1/(\pi\sqrt{LC})$
d) $1/(2\pi\sqrt{LC})$
3. The expression of bandwidth for parallel resonant circuit is?
a) 1/RC
b) RC
c) 1/R
d) 1/C
4. The quality factor in case of parallel resonant circuit is?
a) C
b) $\omega_r RC$
c) $\omega_r C$
d) $1/\omega_r RC$
5. The quality factor is the product of 2π and the ratio of _____ to _____
a) maximum energy stored, energy dissipated per cycle
b) energy dissipated per cycle, maximum energy stored
c) maximum energy stored per cycle, energy dissipated
d) energy dissipated, maximum energy stored per cycle
6. The maximum energy stored in a capacitor is?
a) CV^2
b) $CV^2/2$
c) $CV^2/4$
d) $CV^2/8$
7. The expression of quality factor is?
a) I_L/I
b) I/I_L
c) IL
d) I
8. The quality factor is defined as?
a) I
b) I_C

c) I/I_C
d) I_C/I
9. In the circuit shown in the figure, an inductance of 0.1H having a Q of 5 is in parallel with a capacitor.

Determine the value coil resistance (Ω) of at a resonant frequency of 500 rad/sec.



a) 10
b) 20
c) 30
d) 40
10. Find the value of capacitance (μF) in the circuit shown in the question 9.
a) 10
b) 20
c) 30
d) 40

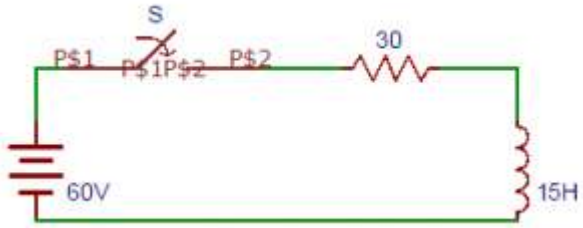
NETWORK THEORY QUESTIONS AND ANSWERS – DC RESPONSE OF AN CIRCUIT:

This set of Network Theory Multiple Choice Questions & Answers (MCQs) focuses on "DC Response of an R-L Circuit".

1. The expression of current in R- L circuit is?
a) i=(V/R)(1+exp((R/L)t))
b) i=-(V/R)(1-exp((R/L)t))
c) i=-(V/R)(1+exp((R/L)t))
d) i=(V/R)(1-exp((R/L)t))
2. The steady state part in the expression of current in the R-L circuit is?
a) (V/R)(exp((R/L)t))
b) (V/R)(-exp((R/L)t))
c) V/R
d) R/V
3. In the expression of current in the R-L circuit the transient part is?
a) R/V
b) (V/R)(-exp((R/L)t))
c) (V/R)(exp((R/L)t))
d) V/R
.

4. The value of the time constant in the R-L circuit is?
a) L/R
b) R/L
c) R
d) L
5. After how many time constants, the transient part reaches more than 99 percent of its final value?
a) 2

b) 3
c) 4
d) 5
6. A series R-L circuit with R = 30Ω and L = 15H has a constant voltage V = 60V applied at t = 0 as figure. Determine the current (A) in the circuit at t = 0+.



a) 1
b) 2
c) 3
d) 0
7. The expression of current obtained from the circuit in terms of differentiation from the circuit shown in the question 6?
a) di/dt+i=4
b) di/dt+2i=0
c) di/dt+2i=4
d) di/dt-2i=4
8. The expression of current from the circuit shown in the question 6 is?
a) $i=2(1-e^{-2t})A$
b) $i=2(1+e^{-2t})A$
c) $i=2(1+e^{2t})A$
d) $i=2(1+e^{2t})A$

9. The expression of voltage across resistor in the circuit shown in the question 6 is?
a) $V_R=60(1+e^{2t})V$
b) $V_R=60(1-e^{-2t})V$
c) $V_R=60(1-e^{2t})V$
d) $V_R=60(1+e^{-2t})V$
10. Determine the voltage across the inductor in the circuit shown in the question 6 is?
a) $V_L=60(-e^{-2t})V$
b) $V_L=60(e^{2t})V$
c) $V_L=60(e^{-2t})V$
d) $V_L=60(-e^{2t})V$

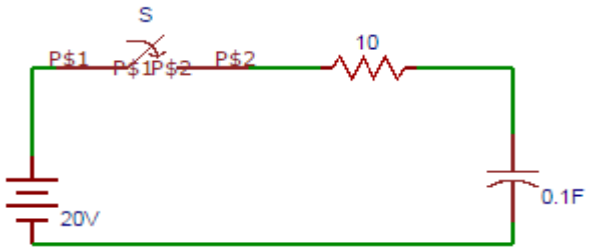
NETWORK THEORY QUESTIONS AND ANSWERS – DC RESPONSE OF AN R-C CIRCUIT:

This set of Network Theory Multiple Choice Questions & Answers (MCQs) focuses on "DC Response of an R-C Circuit".

1. The current in the R-L circuit at a time t = 0+ is?
a) V/R
b) R/V
c) V
d) R
2. The expression of current in R- C circuit is?
a) i=(V/R)exp(t/RC)

b) i=(V/R)exp(-t/RC)
c) i=(V/R)-exp(t/RC)
d) i=(V/R)-exp(-t/RC)
3. In an R-C circuit, when the switch is closed, the response _____
a) do not vary with time
b) decays with time
c) rises with time
d) first increases and then decreases
4. The time constant of an R-C circuit is?
a) RC
b) R/C
c) R
d) C
.

5. After how many time constants, the transient part reaches more than 99 percent of its final value?
a) 2
b) 3
c) 4
d) 5
6.A series R-C circuit consists of resistor of 10 and capacitor of 0.1F as shown in the figure. A constant voltage of 20V is applied to the circuit at t = 0. What is the current in the circuit at t = 0?



a) 1
b) 2
c) 3
d) 4
7. The expression of current obtained from the circuit in terms of differentiation from the circuit shown in the question 6?
a) di/dt+i=1
b) di/dt+i=2
c) di/dt+i=3
d) di/dt+i=0
8. The current equation in the circuit shown in the question 6 is?
a) $i=2(e^{-2t})A$
b) $i=2(e^{2t})A$
c) $i=2(-e^{-2t})A$
d) $i=2(-e^{2t})A$
9. The expression of voltage across resistor in the circuit shown in the question 6 is?
a) $V_R=20(e^{t})V$
b) $V_R=20(-e^{-t})V$
c) $V_R=20(-e^{t})V$
d) $V_R=20(e^{-t})V$

10. Determine the voltage across the capacitor in the circuit shown in the question 6 is?
a) $V_C = 60(1-e^{-t})V$
b) $V_C = 60(1+e^{t})V$
c) $V_C = 60(1-e^{t})V$
d) $V_C = 60(1+e^{-t})$

NETWORK THEORY QUESTIONS AND ANSWERS – DC RESPONSE OF AN R-L-C CIRCUIT:

This set of Network Theory Multiple Choice Questions & Answers (MCQs) focuses on "DC Response of an R-L-C Circuit".

1. For an R-L-C circuit, we get $[D – (K_1 + K_2)][D – (K_1 – K_2)]\ i = 0$. If K_2 is positive, then the curve will be?
a) damped
b) over damped
c) under damped
d) critically damped
2. If the roots of an equation are real and unequal, then the response will be?
a) critically damped
b) under damped
c) over damped
d) damped
3. If the roots of an equation are complex conjugate, then the response will be?
a) over damped
b) critically damped
c) damped
d) under damped
4. If the roots of an equation are real and equal, then the response will be?
a) over damped
b) damped
c) critically damped
d) under damped
5. The circuit shown in the figure consists of resistance, capacitance and inductance in series with a 100V source when the switch is closed at t = 0. Find the equation obtained from the circuit in terms of current.

a) $100 = 20i + 0.05\frac{di}{dt} + \frac{1}{20\times10^{-6}}\int i\,dt$
b) $100 = 20i - 0.05\frac{di}{dt} + \frac{1}{20\times10^{-6}}\int i\,dt$
c) $100 - 20i + 0.05\frac{di}{dt} - \frac{1}{20\times10^{-6}}\int i\,dt$
d) $100 = 20i - 0.05\frac{di}{dt} - \frac{1}{20\times10^{-6}}\int i\,dt$

6.Replacing the differentiation with D_1, D_2 in the equation obtained from the question 5. Find the values

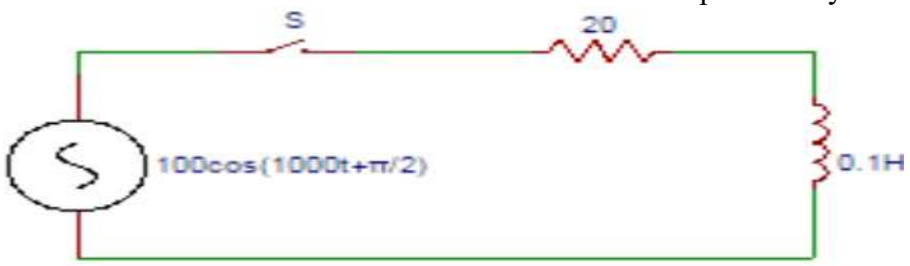
of D_1, D_2.
a) 200±j979.8
b) -200±j979.8
c) 100±j979.8
d) -100±j979.8
7. The expression of current from the circuit shown in the question 5.
a) $i=e^{-200t}$ [c_1 cos979.8t+c_2 979.8t]A
b) $i=e^{200t}$ [c_1 cos979.8t-c_2 979.8t]A
c) $i=e^{-200t}$ [c_1 cos979.8t-c_2 979.8t]A
d) $i=e^{200t}$ [c_1 cos979.8t+c_2 979.8t]A

8.At time t = 0, the value of current in the circuit shown in the question 5.
a) 1
b) 2
c) 3
d) 0
9. The voltage across the inductor at t = 0 in the circuit shown in the question 5.
a) 50
b) 100
c) 150
d) 200
10. The current equation obtained from the circuit shown in the question 5.
a) $i=e^{-200t}$ (1.04 sin979.8t)A
b) $i=e^{-200t}$ (2.04 sin979.8t)A
c) $i=e^{-200t}$ (3.04 sin979.8t)A
d) $i=e^{-200t}$ (4.04 sin979.8t)A

This set of Network Theory Multiple Choice Questions & Answers (MCQs) focuses on "Sinusoidal Response an R-L Circuit".

1. In the sinusoidal response of R-L circuit, the complementary function of the solution of i is?
a) $i_c = ce^{-t(R/L)}$
b) $i_c = ce^{t(RL)}$
c) $i_c = ce^{-t(RL)}$
d) $i_c = ce^{t(R/L)}$
2. The particular current obtained from the solution of i in the sinusoidal response of R-L circuit is?
a) $i_p = V/\sqrt{(R^2+(\omega L)^2)}\cos(\omega t+\theta+\tan^{-1}(\omega L/R))$
b) $i_p = V/\sqrt{(R^2+(\omega L)^2)}\cos(\omega t+\theta-\tan^{-1}(\omega L/R))$
c) $i_p = V/\sqrt{(R^2+(\omega L)^2)}\cos(\omega t-\theta+\tan^{-1}(\omega L/R))$
d) $i_p = V/\sqrt{(R^2+(\omega L)^2)}\cos(\omega t-\theta+\tan^{-1}(\omega L/R))$
3. The value of 'c' in complementary function of 'i' is?
a) $c = -V/\sqrt{(R^2+(\omega L)^2)}\cos(\theta+\tan^{-1}(\omega L/R))$
b) $c = -V/\sqrt{(R^2+(\omega L)^2)}\cos(\theta-\tan^{-1}(\omega L/R))$
c) $c = V/\sqrt{(R^2+(\omega L)^2)}\cos(\theta+\tan^{-1}(\omega L/R))$
d) $c = V/\sqrt{(R^2+(\omega L)^2)}\cos(\theta-\tan^{-1}(\omega L/R))$
4. The complete solution of the current in the sinusoidal response of R-L circuit is?
a) $i = e^{-t(R/L)}[V/\sqrt{(R^2+(\omega L)^2)}\cos(\theta-\tan^{-1})(\omega L/R))]+V/\sqrt{(R^2+(\omega L)^2)}\cos(\omega t+\theta-\tan^{-1})(\omega L/R))$
b) $i = e^{-t(R/L)}[-V/\sqrt{(R^2+(\omega L)^2)}\cos(\theta-\tan^{-1})(\omega L/R))]-V/\sqrt{(R^2+(\omega L)^2)}\cos(\omega t+\theta-\tan^{-1})(\omega L/R))$
c) $i = e^{-t(R/L)}[V/\sqrt{(R^2+(\omega L)^2)}\cos(\theta-\tan^{-1})(\omega L/R))]-V/\sqrt{(R^2+(\omega L)^2)}\cos(\omega t+\theta-\tan^{-1})(\omega L/R))$
d) $i = e^{-t(R/L)}[-V/\sqrt{(R^2+(\omega L)^2)}\cos(\theta-\tan^{-1})(\omega L/R))]+V/\sqrt{(R^2+(\omega L)^2)}\cos(\omega t+\theta-\tan^{-1})(\omega L/R))$
5. In the circuit shown below, the switch is closed at t = 0, applied voltage is v (t) = 100cos (103t+π/2),

resistance R = 20Ω and inductance L = 0.1H. The complementary function of the solution of 'i' is?



a) $i_c = ce^{-100t}$
b) $i_c = ce^{100t}$
c) $i_c = ce^{-200t}$
d) $i_c = ce^{200t}$

6. The particular integral of the solution of 'i' from the information provided in the question 5.
a) $i_p = 0.98\cos(1000t+\pi/2-78.6^o)$
b) $i_p = 0.98\cos(1000t-\pi/2-78.6^o)$
c) $i_p = 0.98\cos(1000t-\pi/2+78.6^o)$
d) $i_p = 0.98\cos(1000t+\pi/2+78.6^o)$
7. The complete solution of 'i' from the information provided in the question 5.
a) $i = ce^{-200t} + 0.98\cos(1000t-\pi/2-78.6^o)$
b) $i = ce^{-200t} + 0.98\cos(1000t+\pi/2-78.6^o)$
c) $i = ce^{-200t} + 0.98\cos(1000t+\pi/2+78.6^o)$
d) $i = ce^{-200t} + 0.98\cos(1000t-\pi/2+78.6^o)$

8. The current flowing through the circuit at t = 0 in the circuit shown in the question 5 is?

a) 1
b) 2
c) 3
d) 0
9. The value of c in the complementary function of 'i' in the question 5 is?
a) $c = -0.98\cos(\pi/2-78.6^o)$
b) $c = -0.98\cos(\pi/2+78.6^o)$
c) $c = 0.98\cos(\pi/2+78.6^o)$
d) $c = 0.98\cos(\pi/2-78.6^o)$
10. The complete solution of 'i' in the question 5 is?
a) $i = [-0.98\cos(\pi/2-78.6^o)]\exp(-200t)+0.98\cos(1000t+\pi/2-78.6^o)$
b) $i = [-0.98\cos(\pi/2-78.6^o)]\exp(-200t)-0.98\cos(1000t+\pi/2-78.6^o)$
c) $i = [0.98\cos(\pi/2-78.6^o)]\exp(-200t)-0.98\cos(1000t+\pi/2-78.6^o)$
d) $i = [0.98\cos(\pi/2-78.6^o)]\exp(-200t)+0.98\cos(1000t+\pi/2-78.6^o)$

This set of Network Theory online test focuses on "Sinusoidal Response of an R-C Circuit".

1. In the sinusoidal response of R-C circuit, the complementary function of the solution of i is?
a) $i_c = ce^{-t/RC}$
b) $i_c = ce^{t/RC}$
c) $i_c = ce^{-t/RC}$
d) $i_c = ce^{t/RC}$
2. The particular current obtained from the solution of i in the sinusoidal response of R-C circuit is?
a) $i_p = V/\sqrt{(R^2+(1/\omega C)^2}\ )\cos(\omega t+\theta+\tan^{-1}(1/\omega RC))$

b) $i_p = -V/\sqrt{(R^2+(1/\omega C)^2}\ ) \cos(\omega t+\theta-\tan^{-1}(1/\omega RC))$
c) $i_p = V/\sqrt{(R^2+(1/\omega C)^2}\ ) \cos(\omega t+\theta-\tan^{-1}(1/\omega RC))$
d) $i_p = -V/\sqrt{(R^2+(1/\omega C)^2}\ ) \cos(\omega t+\theta+\tan^{-1}(1/\omega RC))$
3. The value of 'c' in complementary function of 'i' is?
a) $c = V/R \cos\theta+V/\sqrt{(R^2+(1/(\omega C))^2}\ ) \cos(\theta+\tan^{-1}(1/\omega RC))$
b) $c = V/R \cos\theta+V/\sqrt{(R^2+(1/(\omega C))^2}\ ) \cos(\theta-\tan^{-1}(1/\omega RC))$
c) $c = V/R \cos\theta-V/\sqrt{(R^2+(1/(\omega C))^2}\ ) \cos(\theta-\tan^{-1}(1/\omega RC))$
d) $c = V/R \cos\theta-V/\sqrt{(R^2+(1/(\omega C))^2}\ ) \cos(\theta+\tan^{-1}(1/\omega RC))$

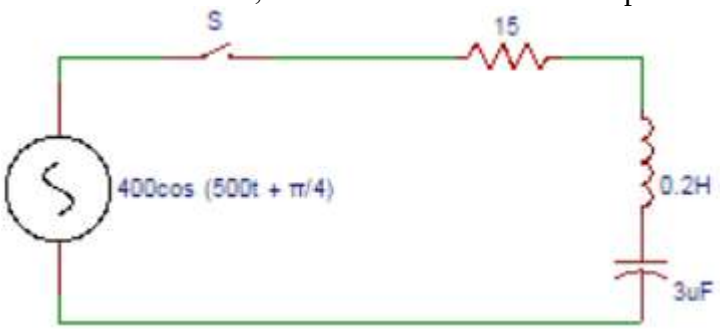
4. The particular integral of the solution of 'i' from the information provided in the question 5.
a) $i_p = (4.99\times10^{-3}) \cos(100t+\pi/4-89.94^o)$
b) $i_p = (4.99\times10^{-3}) \cos(100t-\pi/4-89.94^o)$
c) $i_p = (4.99\times10^{-3}) \cos(100t-\pi/4+89.94^o)$
d) $i_p = (4.99\times10^{-3}) \cos(100t+\pi/4+89.94^o)$
5. The current flowing in the circuit at t = 0 in the question 5 is?
a) 1.53
b) 2.53
c) 3.53
d) 4.53
6. The complete solution of 'i' from the information provided in the question 5.
a) $i = c \exp(-t/10^{-5}) - (4.99\times10^{-3}) \cos(100t+\pi/2+89.94^o)$
b) $i = c \exp(-t/10^{-5}) + (4.99\times10^{-3}) \cos(100t+\pi/2+89.94^o)$
c) $i = -c \exp(-t/10^{-5}) + (4.99\times10^{-3}) \cos(100t+\pi/2+89.94^o)$
d) $i = -c \exp(-t/10^{-5}) - (4.99\times10^{-3}) \cos(100t+\pi/2+89.94^o)$
7. The value of c in the complementary function of 'i' in the question 5 is?
a) $c = (3.53-4.99\times10^{-3}) \cos(\pi/4+89.94^o)$
b) $c = (3.53+4.99\times10^{-3}) \cos(\pi/4+89.94^o)$
c) $c = (3.53+4.99\times10^{-3}) \cos(\pi/4-89.94^o)$
d) $c = (3.53-4.99\times10^{-3}) \cos(\pi/4-89.94^o)$
8. The complete solution of 'i' in the question 5 is?
a) $i = [(3.53-4.99\times10^{-3})\cos(\pi/4+89.94^o)] \exp(-t/0.00001)+4.99\times10^{-3}) \cos(100t+\pi/2+89.94^o)$
b) $i = [(3.53+4.99\times10^{-3})\cos(\pi/4+89.94^o)] \exp(-t/0.00001)+4.99\times10^{-3}) \cos(100t+\pi/2+89.94^o)$
c) $i = [(3.53+4.99\times10^{-3})\cos(\pi/4+89.94^o)] \exp(-t/0.00001)-4.99\times10^{-3}) \cos(100t+\pi/2+89.94^o)$
d) $i = [(3.53-4.99\times10^{-3})\cos(\pi/4+89.94^o)] \exp(-t/0.00001)-4.99\times10^{-3}) \cos(100t+\pi/2+89.94^o)$
.Network Theory Questions and Answers – Sinusoidal Response of an R-L-C Circuit

This set of Network Theory Multiple Choice Questions & Answers (MCQs) focuses on "Sinusoidal

Response of an R-L-C Circuit".

1. The particular current obtained from the solution of i in the sinusoidal response of R-L-C circuit is?
a) $i_p = V/\sqrt{(R^2+(1/\omega C+\omega L)^2}\ ) \cos(\omega t+\theta+\tan^{-1})(1/((1/\omega C+\omega L)/R))$
b) $i_p = V/\sqrt{(R^2+(1/\omega C-\omega L)^2}\ ) \cos(\omega t+\theta+\tan^{-1})(1/((1/\omega C-\omega L)/R))$
c) $i_p = V/\sqrt{(R^2+(1/\omega C+\omega L)^2}\ ) \cos(\omega t+\theta+\tan^{-1})(1/((1/\omega C-\omega L)/R))$
d) $i_p = V/\sqrt{(R^2+(1/\omega C-\omega L)^2}\ ) \cos(\omega t+\theta+\tan^{-1})(1/((1/\omega C+\omega L)/R))$
2. . In the sinusoidal response of R-L-C circuit, the complementary function of the solution of i is?
a) $i_c = c_1 e^{(K_1+K_2)t} + c_1 e^{(K_1-K_2)t}$
b) $i_c = c_1 e^{(K_1-K_2)t} + c_1 e^{(K_1-K_2)t}$
c) $i_c = c_1 e^{(K_1+K_2)t} + c_1 e^{(K_2-K_1)t}$
d) $i_c = c_1 e^{(K_1+K_2)t} + c_1 e^{(K_1+K_2)t}$
3. The complete solution of the current in the sinusoidal response of R-L-C circuit is?
a) $i = c_1 e^{(K_1+K_2)t} + c_1 e^{(K_1-K_2)t} - V/\sqrt{(R^2+(1/\omega C-\omega L)^2}\ ) \cos(\omega t+\theta+\tan^{-1})(1/((1/\omega C-\omega L)/R))$
b) $i = c_1 e^{(K_1+K_2)t} + c_1 e^{(K_1-K_2)t} - V/\sqrt{(R^2+(1/\omega C-\omega L)^2}\ ) \cos(\omega t+\theta-\tan^{-1})(1/((1/\omega C-\omega L)/R))$

c) $i = c_1 e^{(K_1+K_2)t} + c_1 e^{(K_1-K_2)t} + V/\sqrt{(R^2+(1/\omega C-\omega L)^2}\ ) \cos(\omega t+\theta+\tan^{-1}((1/\omega C-\omega L)/R))$
d) $i = c_1 e^{(K_1+K_2)t} + c_1 e^{(K_1-K_2)t} + V/\sqrt{(R^2+(1/\omega C-\omega L)^2}\ ) \cos(\omega t+\theta-\tan^{-1}((1/\omega C-\omega L)/R))$
4. In the circuit shown below, the switch is closed at t = 0. Applied voltage is v (t) = 400cos (500t + π/4). Resistance R = 15Ω, inductance L = 0.2H and capacitance = 3 μF. Find the roots of the characteristic equation.



a) -38.5±j1290
b) 38.5±j1290
c) 37.5±j1290
d) -37.5±j1290
5. Find the complementary current from the information provided in the question 4.
a) $i_c = e^{-37.5t}(c_1\cos1290t + c_2\sin1290t)$
b) $i_c = e^{-37.5t}(c_1\cos1290t - c_2\sin1290t)$
c) $i_c = e^{37.5t}(c_1\cos1290t - c_2\sin1290t)$
d) $i_c = e^{37.5t}(c_1\cos1290t + c_2\sin1290t)$
6. The particular solution from the information provided in the question 4.
a) $i_p = 0.6\cos(500t + \pi/4 + 88.5^o)$
b) $i_p = 0.6\cos(500t + \pi/4 + 89.5^o)$
c) $i_p = 0.7\cos(500t + \pi/4 + 89.5^o)$
d) $i_p = 0.7\cos(500t + \pi/4 + 88.5^o)$
7. The complete solution of current from the information provided in the question 4.
a) $i = e^{-37.5t}(c_1\cos1290t + c_2\sin1290t) + 0.7\cos(500t + \pi/4 + 88.5^o)$
b) $i = e^{-37.5t}(c_1\cos1290t + c_2\sin1290t) + 0.7\cos(500t - \pi/4 + 88.5^o)$
c) $i = e^{-37.5t}(c_1\cos1290t + c_2\sin1290t) - 0.7\cos(500t - \pi/4 + 88.5^o)$
d) $i = e^{-37.5t}(c_1\cos1290t + c_2\sin1290t) - 0.7\cos(500t + \pi/4 + 88.5^o)$
8. The value of the c_1 obtained in the complete solution of question 7.
a) -0.5
b) 0.5
c) 0.6
d) -0.6
9. The value of the c_2 obtained in the complete solution of question 7.
a) 2.3
b) -2.3
c) 1.3
d) -1.3
10. The complete solution of current obtained by substituting the values of c_1 and c_2 is?
a) $i = e^{-37.5t}(0.49\cos1290t - 1.3\sin1290t) + 0.7\cos(500t + 133.5^o)$
b) $i = e^{-37.5t}(0.49\cos1290t - 1.3\sin1290t) - 0.7\cos(500t + 133.5^o)$
c) $i = e^{-37.5t}(0.49\cos1290t + 1.3\sin1290t) - 0.7\cos(500t + 133.5^o)$
d) $i = e^{-37.5t}(0.49\cos1290t + 1.3\sin1290t) + 0.7\cos(500t + 133.5^o)$

Network Theory Questions and Answers – Definition of the Laplace Transform

This set of Network Theory Multiple Choice Questions & Answers (MCQs) focuses on “Definition of the Laplace Transform”.

1. The Laplace transform of a function f (t) is?

a) $\int_0^\infty f(t)e^{-st}$

b) $\int_{-\infty}^0 f(t)e^{-st}$

c) $\int_0^\infty f(t)e^{st}$

d) $\int_{-\infty}^0 f(t)e^{st}$

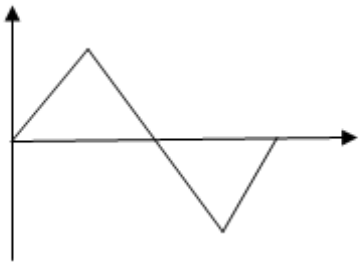
.

2. Laplace transform changes the ____ domain function to the _____ domain function.
a) time, time
b) time, frequency
c) frequency, time
d) frequency, frequency

.3. In the bilateral Laplace transform, the lower limit is?
a) 0
b) 1
c) ∞
d) – ∞

.4. The unit step is not defined at t =?
a) 0
b) 1
c) 2
d) 3

.5. The total period of the function shown in the figure is 4 sec and the amplitude is 10. Find the function f_1 (t) from t = 0 to 1 in terms of unit step function.



a) 10t [u (t) – u (t + 1)].
b) 10t [u (t) + u (t – 1)].
c) 10t [u (t) + u (t + 1)].
d) 10t [u (t) – u (t – 1)].

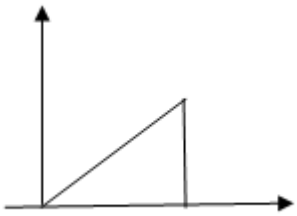
.6. Find the function f_2 (t) from the time t = 1 to 3 sec.
a) (-10t+20) [u (t-1) +u (t-3)].
b) (-10t+20) [u (t-1) – u (t-3)].
c) (-10t-20) [u (t-1) + u (t-3)].
d) (-10t-20) [u (t-1) – u (t-3)].

.7. Find the function f_3 (t) from the time t = 3 to 4 sec.
a) (20t – 40) [u (t-3) – u (t-4)].
b) (20t + 40) [u (t-3) – u (t-4)].
c) (20t + 40) [u (t-3) + u (t-4)].
d) (20t – 40) [u (t-3) + u (t-4)].

.8. Find the expression of f (t) in the graph shown in question 5.

a) 10t [u (t) – u (t – 1)] – (-10t+20) [u (t-1) – u (t-3)] + (20t – 40) [u (t-3) – u (t-4)].
b) 10t [u (t) – u (t – 1)] – (-10t+20) [u (t-1) – u (t-3)] – (20t – 40) [u (t-3) – u (t-4)].
c) 10t [u (t) – u (t – 1)] + (-10t+20) [u (t-1) – u (t-3)] + (20t – 40) [u (t-3) – u (t-4)].
d) 10t [u (t) – u (t – 1)] + (-10t+20) [u (t-1) – u (t-3)] – (20t – 40) [u (t-3) – u (t-4)].
.

9. In the graph shown below, find the expression f (t).

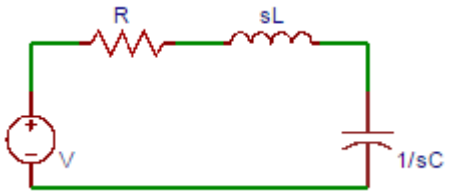


a) 2t
b) 3t
c) 4t
d) 5t
.10. Find the function f (t) in terms of unit step function in the graph shown in question 9.
a) 4t [u (t) – u (t + 5)].
b) 4t [u (t) + u (t + 5)].
c) 4t [u (t) – u (t – 5)].
d) 4t [u (t) + u (t – 5)].
.Network Theory Questions and Answers – Transfer Function

This set of Network Theory Multiple Choice Questions & Answers (MCQs) focuses on “Transfer Function”.

1. The transfer function of a system having the input as X(s) and output as Y(s) is?
a) Y(s)/X(s)
b) Y(s) * X(s)
c) Y(s) + X(s)
d) Y(s) – X(s)
.

2. In the circuit shown below, if current is defined as the response signal of the circuit, then determine the transfer function.



a) H(s)=C/(S^2 LC+RCS+1)
b) H(s)=SC/(S^2 LC-RCS+1)
c) H(s)=SC/(S^2 LC+RCS+1)
d) H(s)=SC/(S^2 LC+RCS-1)
.

3. In the circuit shown in question 2, if voltage across the capacitor is defined as the output signal of the

the transfer function is?
a) H(s)=1/(S^2 LC-RCS+1)
b) H(s)=1/(S^2 LC+RCS+1)

c) $H(s)=1/(S^2 LC+RCS-1)$
d) $H(s)=1/(S^2 LC-RCS-1)$
.

4. Let us assume x (t) = A cos(ωt + φ), then the Laplace transform of x (t) is?
a) $X(S)=A(Scos Ø-ω sinØ)/(S^2-ω^2)$
b) $X(S)=A(Scos Ø+ω sinØ)/(S^2+ω^2)$
c) $X(S)=A(Scos Ø+ω sinØ)/(S^2-ω^2)$
d) $X(S)=A(Scos Ø-ω sinØ)/(S^2+ω^2)$
.

5. The s-domain expression for the response for the input mentioned in question 4 is?
a) $Y(s)=H(s)A(Scos Ø-ω sinØ)/(S^2-ω^2)$
b) $Y(s)=H(s) A(Scos Ø+ω sinØ)/(S^2+ω^2)$
c) $Y(s)=H(s) A(Scos Ø-ω sinØ)/(S^2+ω^2)$
d) $Y(s)=H(s) A(Scos Ø+ω sinØ)/(S^2-ω^2)$
.

6. On taking the partial fractions for the response in the question 4, we get?
a) $Y(s)=k_1/(s-jω)+(k_1`)/(s+jω)+$Σterms generated by the poles of H(s)
b) $Y(s)=k_1/(s+jω)+(k_1`)/(s+jω)+$Σterms generated by the poles of H(s)
c) $Y(s)=k_1/(s+jω)+(k_1`)/(s-jω)+$Σterms generated by the poles of H(s)
d) $Y(s)=k_1/(s-jω)+(k_1`)/(s-jω)+$Σterms generated by the poles of H(s)
7. The value of k_1 in the question 6 is?
a) $1/2 H(jω)Ae^{jØ}$
b) $H(jω)Ae^{-jØ}$
c) $H(jω)Ae^{jØ}$
d) $1/2 H(jω)Ae^{-jØ}$
8. The relation between H (jω) and θ (ω) is?
a) $H(jω)=e^{-jθ(ω)}$
b) $H(jω)=|H(jω)|e^{-jθ(ω)}$
c) $H(jω)=|H(jω)|e^{jθ(ω)}$
d) $H(jω)=e^{jθ(ω)}$
9. The value of k_1 in the question 6 considering θ (ω) is?
a) $|H(jω)|e^{j[θ(ω)+Ø]}$
b) $A/2|H(jω)|e^{j[θ(ω)+Ø]}$
c) $|H(jω)|e^{-j[θ(ω)+Ø]}$
d) $A/2 |H(jω)| e^{-j[θ(ω)+Ø]}$
10. The final steady state solution for y (t) in the question 4 is?
a) $A|H(jω)| cos[ωt+Ø+θ(ω)]$.
b) $A|H(jω)| cos[ωt-Ø+θ(ω)]$.
c) $A|H(jω)| cos[ωt-Ø-θ(ω)]$.
d) $A|H(jω)| cos[ωt+Ø-θ(ω)]$.

Network Theory Questions and Answers – Circuit Elements in the S-Domain

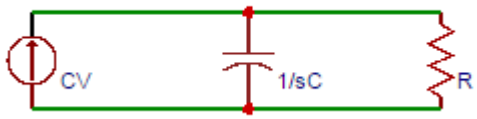
This set of Network Theory Multiple Choice Questions & Answers (MCQs) focuses on "Circuit Elements in the S-Domain".

1. The resistance element _____ while going from the time domain to frequency domain.
a) does not change
b) increases
c) decreases
d) increases exponentially

2. The relation between current and voltage in case of inductor is?
a) v=Ldt/di
b) v=Ldi/dt
c) v=dt/di
d) v=di/dt
3. The s-domain equivalent of the inductor reduces to an inductor with impedance?
a) L
b) sL
c) s^2L
d) s^3L
4. The voltage and current in a capacitor are related as?
a) i=Cdt/dv
b) v=Cdv/dt
c) i=Cdv/dt
d) v=Cdt/dv
5. The s-domain equivalent of the capacitor reduces to an capacitor with impedance?
a) sC
b) C
c) 1/C
d) 1/sC
6. From the circuit shown below, find the value of current in the loop.

a) (V/R)/(s+1/RC)
b) (V/C)/(s+1/R)
c) (V/C)/(s+1/RC)
d) (V/R)/(s+1/R)
7. After taking the inverse transform of current in the circuit shown in question 6, the value of current is?
a) $i=(V/C)e^{-t/R}$
b) $i=(V/C)e^{-t/RC}$
c) $i=(V/R)e^{-t/RC}$
d) $i=(V/R)e^{-t/R}$
8. The voltage across the resistor in the circuit shown in question 6 is?
a) $Ve^{t/R}$
b) $Ve^{-t/RC}$
c) $Ve^{-t/R}$
d) $Ve^{t/RC}$
.

9. The voltage across the resistor in the parallel circuit shown is?



a) V/(s-1/R)
b) V/(s-1/RC)
c) V/(s+1/RC)
d) V/(s+1/C)
10. Taking the inverse transform of the voltage across the resistor in the circuit shown in question 9.
a) $Ve^{-t/\tau}$
b) $Ve^{t/\tau}$
c) $Ve^{t\tau}$
d) $Ve^{-t\tau}$

Network Theory Questions and Answers – Poles and Zeros of Network Functions

This set of Basic Network Theory Questions and Answers focuses on "Poles and Zeros of Network Functions".

1. The coefficients of the polynomials P (S) and Q (S) in the network function N (S) are _____ for passive network.
   a) real and positive
   b) real and negative
   c) complex and positive
   d) complex and negative
2. The scale factor is denoted by the letter?
   a) G
   b) H
   c) I
   d) J
3. The zeros in the transfer function are denoted by?
   a) 3
   b) 2
   c) 1
   d) 0
4. The poles in the transfer function are denoted by?
   a) x
   b) y
   c) z
   d) w
5. The network function N (S) becomes _____ when s is equal to anyone of the zeros.
   a) 1
   b) 2
   c) 0
   d) ∞
6. The N (S) becomes _____ when s is equal to any of the poles.
   a) ∞
   b) 0
   c) 1

d) 2

7. If the poles or zeros are not repeated, then the function is said to be having _____ poles or _____ zeros.

a) simple, multiple
b) multiple, simple
c) simple, simple
d) multiple, multiple

8. If the poles or zeros are repeated, then the function is said to be having _____ poles or _____ zeros.

a) multiple, multiple
b) simple, simple
c) multiple, simple
d) simple, multiple

9. If the number of zeros (n) are greater than the number of poles (m), then there will be _____ number of zeros at s = ∞.

a) n
b) m
c) n-m
d) n+m

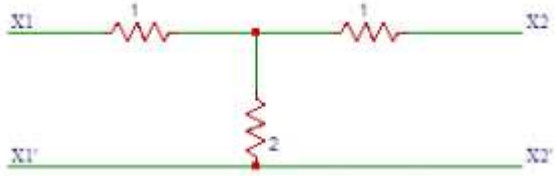
10. If the number of poles (m)are greater than the number of zeros (n), then there will be _____ _ number of zeros at s = ∞.

a) m+n
b) m-n
c) m
d) n

Network Theory Questions and Answers – Inter Connection of Two-Port Networks:

This set of Network Theory Multiple Choice Questions & Answers (MCQs) focuses on "Inter Connection of Two-Port Networks".

1.In the circuit shown below, find the Z-parameter Z_{11}.



a) 1
b) 2
c) 3
d) 4

2. In the circuit shown in question 1, find the Z-parameter Z_{12}.

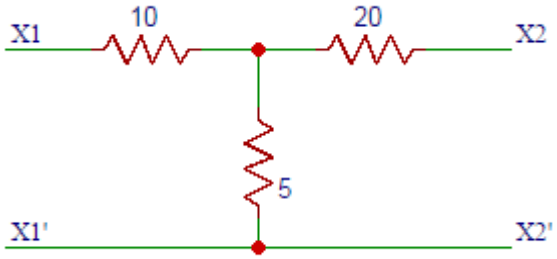
a) 4
b) 3
c) 2

d) 1

3. In the circuit shown in question 1, find the Z-parameter Z_{21}.
a) 2
b) 4
c) 1
d) 3

4. In the circuit shown in question 1, find the Z-parameter Z_{22}.
a) 3
b)2
c) 4
d) 1

5. In the circuit shown below, find the Z-parameter Z_{11}.



a) 10
b) 15
c) 20
d) 25.6. In the circuit shown in question 5, find the Z-parameter Z_{12}.
a) 15
b) 10
c) 5
d) 1.7. From the circuits shown in question 1 in question 5, find the combined Z-parameter Z_{11}.
a) 8
b) 18
c) 28
d) 38
8. From the circuits shown in question 1 in question 5, find the combined Z-parameter Z_{12}.
a) 4
b) 5
c) 6
d) 7
9. From the circuits shown in question 1 in question 5, find the combined Z-parameter Z_{21}.
a) 7
b) 6
c) 5
d) 4

10. From the circuits shown in question 1 in question 5, find the combined Z-parameter Z_{22}.
a) 38
b) 28

c) 18
d) 8

Network Theory Questions and Answers – Image Parameters

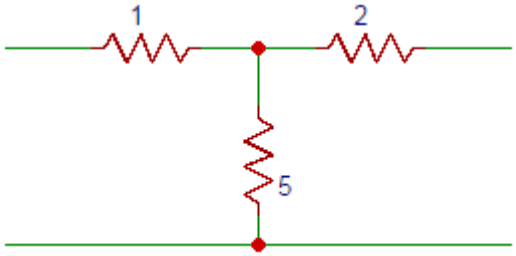
This set of Network Theory Multiple Choice Questions & Answers (MCQs) focuses on “Image Parameters”.

1. A network is said to be symmetrical if the relation between A and D is?
a) A = D
b) A = 2 D
c) A = 3 D
d) A = 4 D

2. The relation between Z_{11} and Z_{12} if the network is symmetrical is?
a) $Z_{11} = 2\ Z_{12}$
b) $Z_{11} = Z_{12}$
c) $Z_{11} = 3\ Z_{12}$
d) $Z_{11} = 4\ Z_{12}$

3. The relation between Z_{12} and Z_{11} and B and C parameters if the network is symmetrical is?
a) $Z_{11} = Z_{12} = B/C$
b) $Z_{11} = Z_{12} = C/B$
c) $Z_{11} = Z_{12} = \sqrt{(B/C)}$
d) $Z_{11} = Z_{12} = \sqrt{(C/B)}$

4. Determine the transmission parameter A in the circuit shown below.



a) 3/4
b) 4/3
c) 5/6
d) 6/5
.

5. Determine the transmission parameter B in the circuit shown in question 4.
a) 17/5
b) 5/17
c) 13/5
d) 5/13

6. Determine the transmission parameter C in the circuit shown in question 4.
a) 2/5
b) 1/5
c) 4/5

d) 3/5

7. Determine the transmission parameter D in the circuit shown in question 4.
a) 3/5
b) 4/5
c) 7/5
d) 2/5

8. The value of Z_{11} in the circuit shown in question 4 is?
a) 1.8
b) 2.8
c) 3.8
d) 4.8

9. The value of Z_{12} in the circuit shown in question 4 is?
a) 1.1
b) 2.2
c) 3.3
d) 4.4

10. Determine the value of Ø in the circuit shown in question 4.
a) 0.25
b) 0.5
c) 0.75
d) 1

Network Theory Questions and Answers – Filter Networks

This set of Network Theory Multiple Choice Questions & Answers (MCQs) focuses on

"Filter Networks".

1. The value of one decibel is equal to?
a) 0.115 N
b) 0.125 N
c) 0.135 N
d) 0.145 N

2. A filter which passes without attenuation all frequencies up to the cut-off frequency f_c and attenuates

all other frequencies greater than f_c is called?
a) high pass filter
b) low pass filter
c) band elimination filter
d) band pass filter

3. A filter which attenuates all frequencies below a designated cut-off frequency f_c and passes all

other frequencies greater than f_c is called?
a) band elimination filter

b) band pass filter
c) low pass filter
d) high pass filter

4 filter that passes frequencies between two designated cut-off frequencies and attenuates all other frequencies is called?
a) high pass filter
b) band elimination filter
c) band pass filter
d) low pass filter
.

6. A filter that passes all frequencies lying outside a certain range, while it attenuates all frequencies between the two designated frequencies is called?
a) low pass filter
b) high pass filter
c) band elimination filter
d) band pass filter

6. The expression of the characteristic impedance of a symmetrical T-section is?
a) $Z_{OT}=\sqrt{(Z_1^2/4-Z_1Z_2)}$
b) $Z_{OT}=\sqrt{(Z_1^2/4+Z_1)}$
c) $Z_{OT}=\sqrt{(Z_1^2/4+Z_2)}$
d) $Z_{OT}=\sqrt{(Z_1^2/4+Z_1Z_2)}$

7. The expression of the open circuit impedance Z_{oc} is?
a) $Z_{oc}=Z_1/2+Z_2$
b) $Z_{oc}=Z_2/2+Z_2$
c) $Z_{oc}=Z_1/2+Z_1$
d) $Z_{oc}=Z_1/2-Z_2$

8. The expression of short circuit impedance Z_{sc} is?
a) $Z_{sc}=(Z_1^2-4Z_1Z_2)/(2Z_1-4Z_2)$
b) $Z_{sc}=(Z_1^2+4Z_1Z_2)/(2Z_1+4Z_2)$
c) $Z_{sc}=(Z_1^2-4Z_1Z_2)/(2Z_1+4Z_2)$
d) $Z_{sc}=(Z_1^2+4Z_1Z_2)/(2Z_1-4Z_2)$

9. The relation between Z_{OT}, Z_{oc}, Z_{sc} is?
a) $Z_{OT}=\sqrt{Z_{oc}Z_{sc}}$
b) $Z_{oc}=\sqrt{(Z_{OT}\ Z_{sc})}$
c) $Z_{sc}=\sqrt{(Z_{OT}\ Z_{oc})}$
d) $Z_{oc}=\sqrt{(Z_{OT}\ Z_{oc})}$

10. The value of $\sinh f_0\Upsilon/2$ in terms of Z_1 and Z_2 is?
a) $\sinh f_0\Upsilon/2=\sqrt{(4Z_1/Z_2)}$
b) $\sinh f_0\Upsilon/2=\sqrt{(Z_1/Z_2)}$

c) $\sinh \Upsilon/2=\sqrt{(Z_1/4Z_2)}$
d) $\sinh \Upsilon/2=\sqrt{(2Z_1/Z_2)}$

NETWORK THEORY QUESTIONS AND ANSWERS – CLASSIFICATION OF PASS BAND AND STOP BAND:

This set of Network Theory Questions and Answers for Entrance exams focuses on "Classification of Pass Band and Stop Band".

1. The relation between α, β, Υ is?
a) $\alpha = \Upsilon + j\beta$
b) $\Upsilon = \alpha + j\beta$
c) $\beta = \Upsilon + j\alpha$
d) $\alpha = \beta + j\Upsilon$

2. If Z_1, Z_2 are same type of reactance, then $|Z_1/4\ Z_2|$ is real, then the value of α is?
a) $\alpha = \sinh^{-1}\sqrt{(\ Z_1/4\ Z_2)}$
b) $\alpha = \sinh^{-1}\sqrt{(\ Z_1/Z_2)}$
c) $\alpha = \sinh^{-1}\sqrt{(\ 4\ Z_1/Z_2)}$
d) $\alpha = \sinh^{-1}\sqrt{(\ Z_1/2\ Z_2)}$

3. If Z_1, Z_2 are same type of reactance, then $|Z_1/4\ Z_2|$ is real, then?
a) $|Z_1/4\ Z_2|=0$
b) $|Z_1/4\ Z_2| < 0$
c) $|Z_1/4\ Z_2| > 0$
d) $|\ Z_1/4\ Z_2|>= 0$
4. Which of the following expression is true if Z_1, Z_2 are same type of reactance?
a) $\sinh \alpha/2 \sin \beta/2=0$
b) $\cosh\alpha/2 \sin \beta/2=0$
c) $\cosh\alpha/2 \cos \beta/2=0$
d) $\sinh\alpha/2 \cos \beta/2=0$

5. Which of the following expression is true if Z_1, Z_2 are same type of reactance?
a) $\sinh\alpha/2 \cos \beta/2=x$
b) $\cosh\alpha/2 \cos \beta/2=0$
c) $\cosh\alpha/2 \sin \beta/2=x$
d) $\sinh\alpha/2 \sin \beta/2=0$

6. The value of α if Z_1, Z_2 are same type of reactance?
a) 0
b) $\pi/2$
c) π

d) 2π

7. The value of β if Z_1, Z_2 are same type of reactance?
a) 2π
b) π
c) $\pi/2$
d) 0

8. If Z_1, Z_2 are same type of reactance, and if $\alpha = 0$, then the value of β is?
a) $\beta=2 \sin^{-1}(\sqrt{(Z_1/4\ Z_2)})$
b) $\beta=2 \sin^{-1}(\sqrt{(4\ Z_1/Z_2)})$
c) $\beta=2 \sin^{-1}(\sqrt{(4\ Z_1/Z_2)})$
d) $\beta=2 \sin^{-1}(\sqrt{(Z_1/Z_2)})$

9. If the value of β is π, and Z_1, Z_2 are same type of reactance, then the value of β is?
a) $\alpha=2 \cosh^{-1}\sqrt{(Z_1/2\ Z_2)}$
b) $\alpha=2 \cosh^{-1}\sqrt{(Z_1/Z_2)}$
c) $\alpha=2 \cosh^{-1}\sqrt{(4\ Z_1/Z_2)}$
d) $\alpha=2 \cosh^{-1}\sqrt{(Z_1/4\ Z_2)}$

10. The relation between $Z_{o\pi}$, Z_1, Z_2, Z_{oT} is?
a) $Z_{oT} = Z_1Z_2/Z_{o\pi}$
b) $Z_{o\pi} = Z_1Z_2/Z_{oT}$
c) $Z_{oT} = Z_1Z_1/Z_{o\pi}$
d) $Z_{oT} = Z_2Z_2/Z_{o\pi}$

NETWORK THEORY QUESTIONS AND ANSWERS – ATTENUATORS:

This set of Network Theory Multiple Choice Questions & Answers (MCQs) focuses on "Attenuators".

1. The attenuation in dB in terms of input power (P_1) and output power (P_2) is?
a) $\log_{10} (P_1/P_2)$
b)$10 \log_{10} (P_1/P_2)$
c) $\log_{10} (P_2/P_1)$
d) $10 \log_{10} (P_2/P_1)$

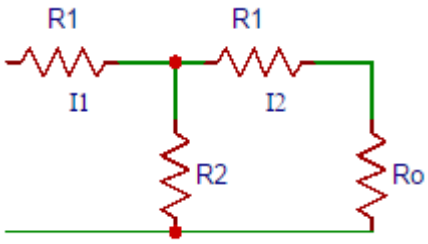
2. If V_1 is the voltage at port 1 and V_2 is the voltage at port 2, then the attenuation in dB is?
a) $20 \log_{10} (V_1/V_2)$
b) $10 \log_{10} (V_1/V_2)$
c) $20 \log_{10} (V_2/V_1)$
d) $10 \log_{10} (V_2/V_1)$

3. What is the attenuation in dB assuming I_1 is the input current and I_2 is the output current leaving the port?
a) $10 \log_{10} (I_1/I_2)$
b) $10 \log_{10} (I_2/I_1)$
c) $20 \log_{10} (I_2/I_1)$
d) $20 \log_{10} (I_1/I_2)$.

4. The value of one decibel is equal to?
a) $\log_{10}$ (N)
b) 10 $\log_{10}$ (N)
c) 20 $\log_{10}$ (N)
d) 40 $\log_{10}$ (N)

5. The value of N in dB is?
a) N= anti log (dB)
b) N= anti log(dB/10)
c) N=anti log(dB/20)
d) N=anti log(dB/40)

6. In the circuit shown below, find the value of I_1/I_2.



a) $(R_1-R_2+R_0)/R_2$
b) $(R_1+R_2+R_0)/R_2$
c) $(R_1-R_2-R_0)/R_2$
d) $(R_1+R_2-R_0)/R_2$

7. Determine the value of N in the circuit shown in question 6.
a) $(R_1+R_2-R_0)/R_2$
b) $(R_1-R_2-R_0)/R_2$
c) $(R_1+R_2+R_0)/R_2$
d) $(R_1-R_2+R_0)/R_2$

8. The value of the characteristic impedance R_0 in terms of R_1 and R_2 and R_0 in the circuit shown in question 6 is?
a) $R_1+R_2(R_1+R_0)/(R_1+R_0+R_2)$
b) $R_1+ R_2(R_1+R_0)/(R_1+R_0+R_2)$
c) $R_2+ R_2(R_1+R_0)/(R_1+R_0+R_2)$
d) $R_0+R_2(R_1+R_2)/(R_1+R_0+R_2)$

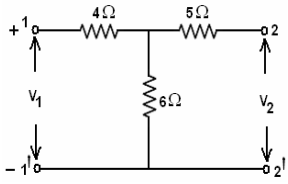
9. Determine the value of R_1 in terms of R_0 and N in the circuit shown in question 6 is?
a) $R_1= R_0(N-1)/(N+1)$
b) $R_1= R_0(N+1)/(N+1)$
c) $R_1= R_0(N-1)/(N-1)$
d) $R_1= R_0(N+1)/(N-1)$

10. Determine the value of R_2 in terms of R_0 and N in the circuit shown in question 6 is?
a) $R_2= NR_0/(N^2-1)$

b) $R_2 = 2\,NR_0/(N^2-1)$
c) $R_2 = 3\,NR_0/(N^2-1)$
d) $R_2 = 4\,NR_0/(N^2-1)$
.

Group - I (Short Answer Questions)

S. No	QUESTION(UNIT-I)	Blooms Taxonomy
1	What are the advantages of a poly phase system over a single phase system	Understand
2	Define Graph, Tree, Basic Cut set and Basic Tie set. Illustrate with an example.	Understand
3	Explain Active elements in detail	Understand
4	Derive the relation between voltage and current in a series connected RL Circuits.	Evaluate
5	Draw a power triangle in series connected RLC networks	Understand
6	Derive the relation between RMS and maximum value.	Evaluate
7	Define form factor and peak factor	Understand
S. no	**QUESTION(II UNIT)**	**Blooms Taxonomy Level**
1	Explain why the current in a pure inductance cannot change in zero time.	Remember
2	Explain why the voltage across a capacitor cannot change instantaneously.	Remember
3	What is the significance of time constant of R-L circuit? What are the different ways of defining time constant?	Remember
4	Derive the expression for i(t) of a R-L series circuit when DC voltage is applied to it at t=0 by closing the switch. Draw the response curve i(t) vs t. define time constant of R-L series circuit.	Analyze
5	Derive the expression for i (t) and voltage across a capacitor Vc(t) for series R-C circuit with D.C voltage applied to it at t=0.Explain about the time constant of R-C circuit	Evaluate
6	Compare the classical and Laplace transform methods of solution of the network	Understand

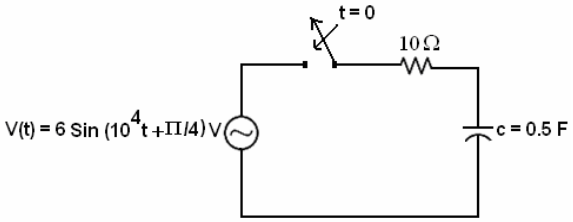
7	Derive an expression for the current response in R-L series circuit with a sinusoidal source	Remember
8	Distinguish between steady state and transient response	Remember
9	A Sinusoidal Voltage of 12 sin 8 t Volts is applied at t = 0 to a RC series of R= 4Ω and L = 1 H. By Laplace transform method determine the circuit current i (t) for. Assume zero initial condition	Evaluate
10	What are initial conditions? Explain the procedure to evaluate initial conditions	Remember
S. No	**QUESTION(III &IV UNIT)**	**Blooms Taxonomy Level**
1	What is a pole-zero plots? What is its significance? Explain time domain behavior from pole zero plot.	Understand
2	Define and explain the following : port, driving point functions And Transfer functions.	Understand
3	What is a transfer function? Explain the necessary conditions for transfer functions	Remember
4	What is a driving point function? Explain the necessary conditions for driving point functions	Remember
5	According to Routh Criteria when a network is said to be stable?	Apply
6	The Laplace transform of a voltage v(t) is V(s)=4(s+1)/(s+2)(s+3). Draw poles and zeros of this function and determine v(t) using pole-zero plot	Apply
7	The transform voltage V(s) of a network is given by V(s) =4s/(s+2)(s2+2s+2) plot its pole-zero diagram and hence obtain v(t)	Apply
8	Find the stability of the network Q(S) =40S/S3 +2S2+8S+1	Evaluate
9	Find Y parameters for the above network shown in Figure 	Evaluate
10	For the given network function draw pole zero diagram and hence obtain the time domain response i(t) if I(s) = 5S / (S+1)(s2+4S+8)	Apply
S. No	**QUESTION(V UNIT)**	**Blooms Taxonomy Level**
1	Define active and passive ports	Understand

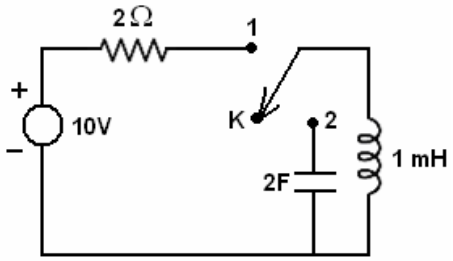
2	Why Z-parameters are called as open circuit impedance (Z) parameter	Understand

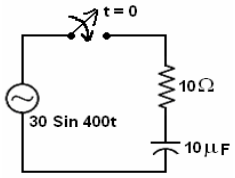
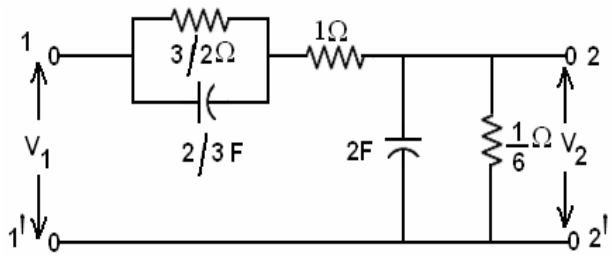
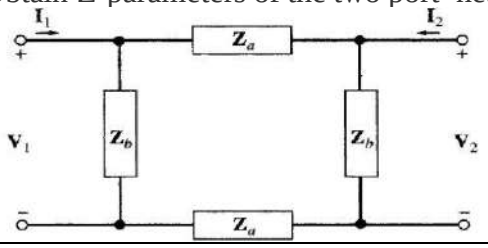
3	Define open circuit forward transfer impedance	Understand
4	Give the condition for reciprocity for Z parameters	Understand
5	Why Y parameters are called as short circuit admittance Parameters	Understand
6	What are the applications of cascaded ABCD parameters	Understand
7	Express y-parameters in terms of h-parameters	Understand
8	Express Z-parameters in terms of h-parameters	Understand
9	Express Z parameters in terms of ABCD parameters	Understand
10	Express h-parameters in terms of ABCD parameters	Understand
11	Define a filter and What are the classification of filters	Understand
12	Explain the formula for characteristic impedance of symmetrical T-Section	Understand
13	Explain the design procedure for a constant K low pass filter and its characteristics	Understand
14	Find the component values of a constant K. LPF having characteristic impedance Z = 500Ω and cut off frequency of 'f_c'= 500 Hz. Find the frequency	Evaluate
15	Write short note on m-derived filters	Remember
16	Design a constant K band elimination filter with cut off frequency 1750 Hz to 4250 Hz and a characteristic impedance of 250Ω	Evaluate
17	Write short notes on Fourier transform theorems.	Understand
18	Write short notes on Exponential form of Fourier series	Understand
19	Write short notes on Line and phase angle spectra	Understand
20	Write short notes on Fourier integrals	Understand

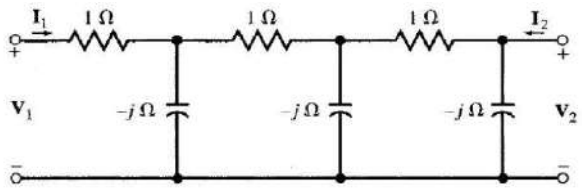
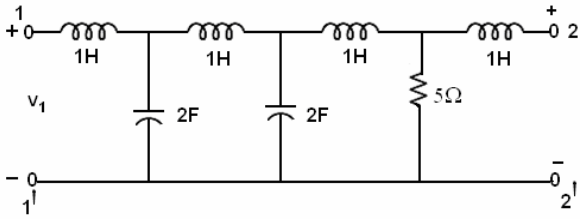
GROUP - II (LONG ANSWER QUESTIONS):

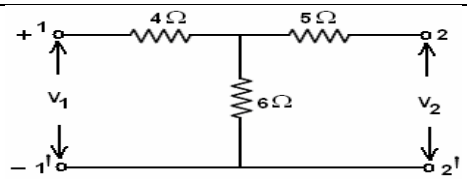
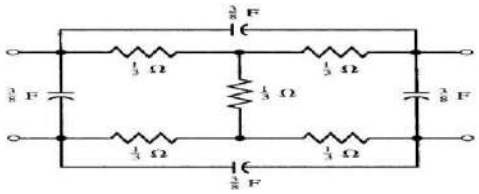
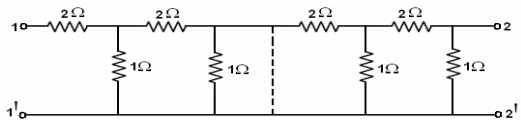
S. No	QUESTION(UNIT-I)	BloomsTaxonomy Level
1	What is an electric circuit? What is a magnetic circuit? Make a comparison between electric circuit and magnetic circuit	Evaluate
2	Coil 1 of a pair of coupled coils has a continuous current of 5A, and the corresponding fluxes ϕ11 and ϕ12 are 0.2 and 0.4 mWb respectively. If the turns	Evaluate
3	What is Graph theory Explain?	Understand
4	Write the expression for total inductance of the three series connected coupled coils (Assume your own directions)	Evaluate

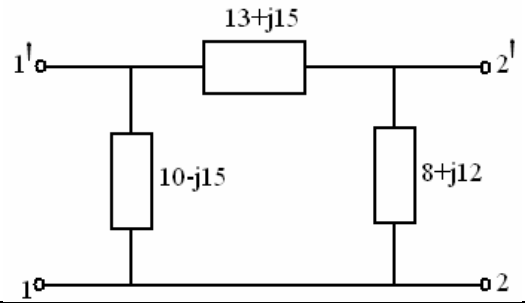
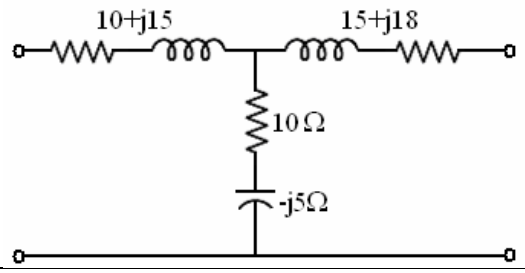
S. No	QUESTION UNIT-II)	BloomsTaxonomy Level
1	For the circuit shown in Figure determine the particular solution for i(t) through the circuit. Assume zero initial conditions 	Evaluate
2	Derive an expression for the response in the system in Figure.2 By time domain and Laplace transform techniques. Cross Check the answer. V (t) = 5(Sin1000t+π/6).	Evaluate

3	For the circuit given in Figure steady state conditions are reached for the switch K in position '1'. At t = 0, the switch is changed to position 2. Use the time domain method to determine the current through the inductor for all t≥0. 	Evaluate
4	A series RL circuit with R = 50 ohms and L = 0.2 H has a sinusoidal voltage source V = 150 (500*Sint* φ+ volts applied at a time when φ=0. Find the expression for the total current. Use Laplace transforms method.	Evaluate
5	A series R C circuit with R = 100 Ω and C = 25 μF has a Sinusoidal excitation V (t) = 250 Sin 500t. Find the total current assuming that the capacitor is initially uncharged	Evaluate
6	For the circuit shown in Figure determine the particular solution for i(t) through the circuit. Assume zero initial conditions	Evaluate

		
10	Find Y_{12} for the circuit in Figure 	Evaluate
S. No	**QUESTION (UNIT-IV)**	**Blooms Taxonomy Level**
1	Obtain Z-parameters of the two port network 	Evaluate

2	Find the Z parameters of the circuit shown 	Evaluate
3	Determine the ABCD parameters of two networks connected in cascade as shown in figure 	Evaluate
4	Find the h-parameters for the circuit in figure	Evaluate

		
5	Find the Y-parameters of the network shown 	Evaluate
6	Determine the ABCD parameters of two networks connected in cascade as shown 	Evaluate
7	The Z parameters of a two port network are Z11=6Ω, Z22=4Ω, Z12=Z21= 3Ω	Evaluate
8	Discuss in detail about series and parallel connection of two port networks	Analyze

9	For the two port network given below (Shown in Figure.3) determine ABCD & hybrid parameters 	Evaluate
10	For the two port network given below (shown in Figure.4) determine Y and ABCD parameters 	Evaluate