PRESIDENCY UNIVERSITY
BENGALURU
School of Engineering
Mid - Term Examinations – Nov 2024

Semester: First   **Date**: 6-11-2024

Course Code: EEE1007   **Time**: 2:00pm – 3:30pm

Course Name: Basics of Electrical and Electronics Engineering   **Max Marks**: 50

Program: BE   **Weightage**: 25%

Instructions:
(i) Read all questions carefully and answer accordingly.
(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks.   **2Mx5Q=10M**

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1	Define active elements and passive elements of an electric circuit and give examples.	2 Marks	L	CO1
2	An alternating emf E=110√2 sin 100t volt is applied to a capacitor of 2microF, the rms value of current in the circuit is ___	2 Marks	L	CO1
3	Energy band is a theoretical model describing the states of electrons, in materials, that can have values of energy only within certain specific ranges. Show the energy level diagram of insulators, Semi-conductors and conductor.	2 Marks	L	CO2
4	The single-phase circuits are electrical circuits that use a single alternating current (AC) waveform. In a pure capacitive circuit current ____ the voltage by an angle of _____.	2 Marks	L	CO2
5	Impurities are atoms that are added to a semiconductor to create different types of conductivity. Define donor and acceptor impurities with examples	2 Marks	L	CO2

Part B

Answer ALL Questions. Each question carries 10 marks.   **4QX10M=40M**

6	6a	A group of students are designing a simple filter using series combination of resistors and inductors. The circuit consists of a 10Ω resistor and a 200mH inductor connected in series with a AC voltage source. The rms voltage of the source is 12V, with a frequency of 50Hz. Calculate the power factor. Also indicate whether the voltage leads/lags the current in this circuit.	5Marks	L	CO1

6b	Three resistors ⎕1=1.00Ω, ⎕2=2.00Ω and ⎕3=2.00Ω are connected in parallel. The parallel connection is attached to a ⎕=3.00⎕ Voltage source.
	  I. What is the equivalent resistance
	  II. Find the current supplied by the source to the parallel circuit.
	  III. Calculate the currents in each resistor and show that these add together to equal the current output of the source.
	  IV. Calculate the power dissipated by each resistor.
	  V. Find the power output of the source and show that it equals the total power dissipated by the resistors**.**
		5Marks	L	CO1

Or

7	**7a**	An AC power source is a device that supplies AC power to various devices, such as lamps and household appliances. Describe the differences between real power, reactive power, and apparent power in an AC circuit. How is the power factor calculated.?	5Marks	L	CO1
	7b	Impedance is a measure of the opposition to electrical flow. What is the concept of impedance in an AC circuit? How does impedance differ from resistance? Explain the role of impedance in determining the phase relationship between voltage and current. Draw the vector diagram of RC Series Circuit.	5Marks	L	CO1
8	**8a**	The relationship between the voltage across the junction and current through the circuit is known as the volt-ampere (V-I) characteristics of a PN junction diode. Explain V-I characteristics of PN junction diode with appropriate figures and list the applications of the diode.	5Marks	L	CO2
	8b	The diode current equation describes the response of current through a diode to the voltage applied across it. Write the diode current equation and explain all the parameters in the diode equation.	5Marks	L	CO2

or

|				
9	**9a**	A rectifier circuit is an electrical device that converts alternating current (AC) into direct current (DC). Draw the circuit diagram of full wave bridge rectifier with relevant input and output waveforms.	5Marks	L	CO2
	9b	A filter circuit in a rectifier is used to transform a pulsating waveform into a constant DC waveform. Explain the working of shunt capacitor filter with relevant waveforms.	5Marks	L	CO2
10	**10a**	Transformation allows us to convert one type of circuit connection into another type in order for us to easily analyse the circuit. Find the equivalent Delta circuit.	5Marks	L	CO1
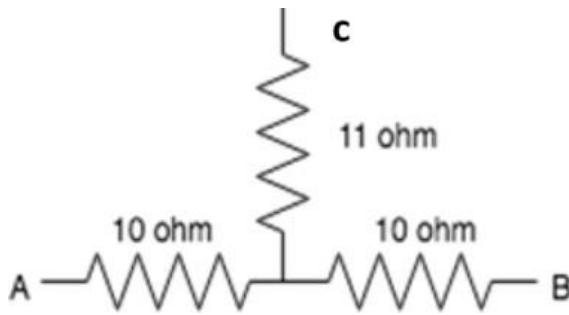
10b Star and Delta connections are two ways to connect three branches in an electrical network, forming either a Y shape or a triangle. Determine the equivalent resistance between terminals A and B | 5Marks | L | CO1
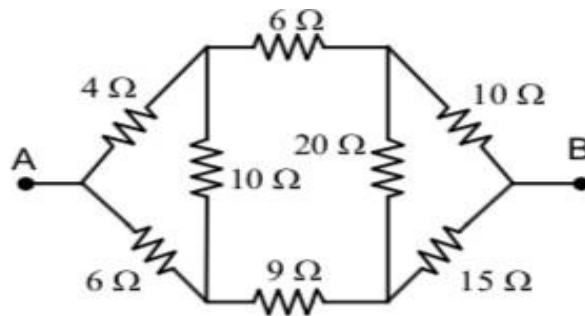
or

11 **11a** The combined effect of resistance R, inductive reactance XL, and capacitive reactance XC is defined to be impedance. A circuit consists of a resistance of 10 Ω, an inductance of 16 mH and a capacitance of 150 µF in series. A supply of 100 V at 50 Hz is applied across the circuit. Find the power consumed by the circuit. Draw the vector diagram. | 5Marks | L | CO1

11b An RLC circuit is defined as a circuit where a resistor, inductor, and capacitor are connected in series across a voltage source, influencing the overall phase and magnitude of the circuit's impedance. A circuit consists of a resistance of 25 Ω, and a capacitance of 100µF in series. A supply of 200V at 50Hz is applied across the circuit. Find the current, power factor and power consumed by the circuit. Draw the vector diagram. | 5Marks | L | CO1

12 **12a** In a semiconductor, the P-N junction is created by the method of doping. Explain the construction and working of PN junction diode in forward and reverse bias condition. | 5Marks | L | CO2

12b For the network shown in Fig., determine i1 and i2. | 5Marks | L | CO1
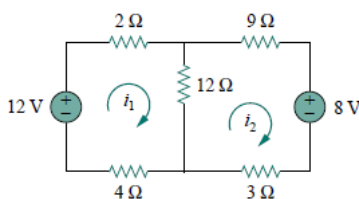
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13	13a	State ohms law and its limitations. A resistance R is connected in series with a parallel circuit comprising two resistances of 12 Ω and 8Ω respectively. The total power dissipated in the circuit is 70 W when the applied voltage is 20V. Calculate R.	5Marks	L	CO1
	13b	A silicon diode working at a temperature of 30^0C, the forward voltage applied across the diode is 0.6V. Determine its forward current, if the reverse saturation current is 20nA.	5Marks	L	CO2