



Model Question Paper

I/II Semester BE Degree Examination

Fundamentals of Electrical Engineering

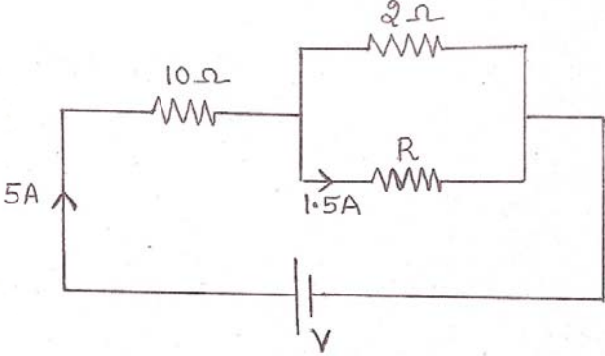
Time: 3 Hours(180 Minutes)

Max. Marks: 100

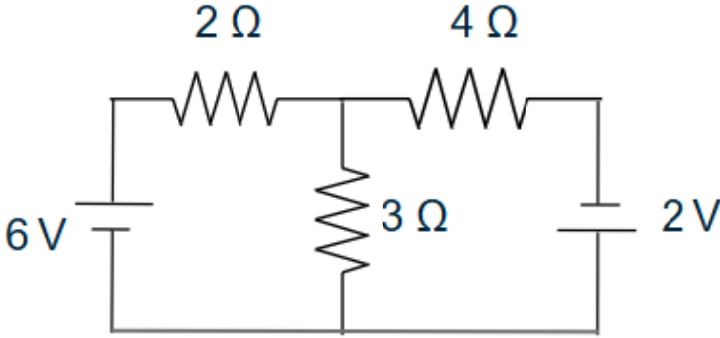
Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.

2. M: Marks, L: RBT (Revised Bloom's Taxonomy) level, C: Course outcomes.

Module -1			M	L	C
Q1	a.	Explain the structure of an electrical power system using a single line diagram approach with a neat sketch by clearly mentioning the voltage levels of each section.	07	L2	CO1
	b.	Define earthing and state the necessity of earthing. Describe the construction and working of Pipe Earthing system with a neat diagram.	07	L2	CO1
	c.	What is block rate tariff? An electric stove with three burners and an oven is used in preparing a meal as follows. Burner 1: 30 minutes Burner 2: 45 minutes Burner 3: 25 minutes Oven: 45 minutes. If each burner is rated at 1.1 kW and the oven at 1.5 kW, and electricity costs Rs.15 per kWh, compute the cost of electricity used in preparing the meal.	06	L3	CO4
OR					
Q2	a.	Explain the Casing-Capping and Conduit wiring systems with neat sketches.	07	L2	CO1
	b.	List the different sources of electrical energy. Describe the grid connected domestic solar PV system with a neat block diagram.	07	L2	CO1
	c.	What is two-part tariff? Compute the electricity bill amount for a month of 30 days, if the following appliances are used per day as specified: i) 1 Electric oven of 750 Watts for 10 minutes ii) 1 Refrigerator of 450 Watts for 10 hours 15 minutes iii) 2 Air Conditioners of 1800 watts each for 3 hours iv) 1 washing machine of 1000W for 1.5 hours Given the rate of electricity is Rs. 7.80 per kWh and fixed rate of Rs. 150/- per month.	06	L3	CO4
Module- 2					
Q3	a.	State the phase relationship between voltage and current in a pure inductive circuit excited by a single-phase AC voltage. Determine its current and power using relevant equations and phasor diagram and draw the voltage, current and power waveforms of the circuit.	07	L2	CO1
	b.	Define the following terms: i) Form factor ii) RMS value A sinusoidally varying current is given by the equation $i = 100 \sin(396.8t)$. Compute: i) the rms value of current ii) instantaneous current at $t=2\text{ms}$ iii) time taken to reach 50A for the first time	07	L3	CO3

	c.	Compute the value of unknown resistor 'R' in the circuit shown in Fig. 3(c). Also calculate the supply voltage V.  Fig. 3(c)	06	L3	CO3
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OR

Q4	a.	State and explain Kirchhoff's Voltage Law and Kirchhoff's Current Law with examples	07	L2	CO1
	b.	State Ohm's law. In the circuit shown in Fig. 4(b), compute the current through each resistor, voltage across 3Ω resistor and power across 4Ω resistor.  Fig. 4(b)	07	L3	CO3
	c.	A coil having a resistance of 25Ω and an inductance of 0.35H are connected in series across a 120V , 50 Hz AC supply. Calculate: i) impedance of the circuit ii) current iii) power and iv) power factor	06	L3	CO3

Module – 3

Q5	a.	State Faraday's law of electromagnetic induction. With a neat sketch, explain the construction of a DC generator.	07	L2	CO2
	b.	State the types of armature winding in DC machines and derive the equation for the generated emf in a DC generator with usual notations.	07	L2	CO2
	c.	An 8-pole lap-connected armature has 960 conductors, a flux of 40mWb per pole and a speed of 400rpm . Compute the emf generated. At what speed must it be driven to generate 400V if the armature were wave connected?	06	L3	CO4

OR

Q6	a.	Define back emf and discuss its significance in a DC motor.	07	L2	CO2
	b.	Explain the working principle of DC motor with suitable diagrams. List the applications of DC motor.	07	L2	CO2
	c.	A 4-pole, 500V , wave-connected DC shunt motor has 720 conductors. The full load current is 60A and the flux per pole is 0.03Wb . The armature resistance and the shunt field resistance are 0.2Ω and 250Ω respectively. The contact drop is	06	L3	CO4

		1V per brush. Calculate i) the full load speed of the motor ii) Torque developed iii) Power developed			
Module – 4					
Q7	a.	Define transformer. Explain the working principle of a single-phase transformer with a neat diagram and derive the EMF equation.	07	L2	CO2
	b.	Explain the generation of a 3-phase AC voltage, along with relevant equations, waveform and phasor diagrams. List the advantages of a 3-phase system.	07	L2	CO1
	c.	Three identical coils connected in delta across 400V, 50Hz, 3-phase supply take a line current of 15A at a power factor 0.8 lagging. Calculate: i) The phase current ii) The impedance iii) Resistance and inductance of each winding	06	L3	CO4
OR					
Q8	a.	Define transformation ratio. Explain the core and shell type transformers with neat sketches.	07	L2	CO2
	b.	Explain the concept of line and phase values of voltage and current in a star and delta connected 3-phase AC system with neat diagrams and relevant equations.	07	L2	CO1
	c.	The primary winding of a transformer is connected to a 240V, 50Hz supply. The secondary winding has 1500 turns. If the maximum flux of the core is 0.00207Wb, determine i) The secondary induced emf ii) Number of turns in the primary iii) Core area if the maximum flux density is 0.465Wb/m^2	06	L3	CO4
Module – 5					
Q9	a.	Explain the construction and operation of a Permanent Magnet Stepper Motor with neat diagrams. List the applications of stepper motors in Robotics and Automation.	10	L2	CO2
	b.	List the basic components of an electric locomotive. Explain its construction and working with a neat diagram.	10	L2	CO2
OR					
Q10	a.	Explain the construction and working of a DC servomotor. List the applications of servomotors. How do DC servomotors differ from DC motors?	10	L2	CO2
	b.	What is a Battery Energy Storage System (BESS)? List the components of BESS and explain its functionalities using neat diagram.	10	L2	CO2
