U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

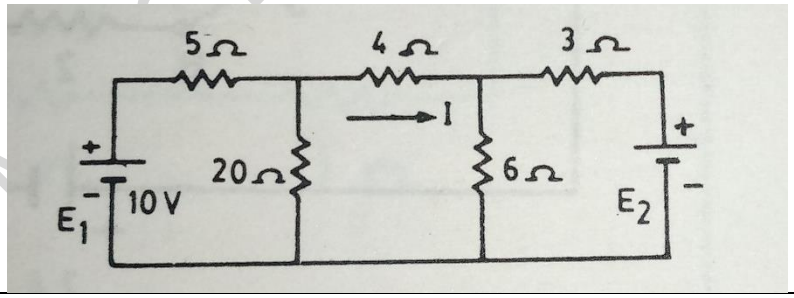
Autonomous Institute Affiliated to VTU

February / March 2025 Semester End Main Examinations

Programme: B.E. **Semester: I / II**
Branch: Common to all Branches **Duration: 3 hrs.**
Course Code: 21EE1ESBEE / 21EE2ESBEE **Max Marks: 100**
Course: Basic Electrical Engineering

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			UNIT - I	*CO*	*PO*	Marks
1	a)		State Kirchhoff's Current and Voltage Laws	*CO1*	*PO1*	**04**
	b)		Two batteries A and B are connected in parallel across a load of 10 Ω. Battery A has an emf of 12 V and an internal resistance of 2 Ω. Battery B has an emf of 8 V and an internal resistance of 1 Ω. Use Kirchhoff's laws to determine the values and directions of the currents flowing in each of the batteries and the load. Also, determine the voltage across the load.	*CO2*	*PO1*	**08**
	c)		With phasor diagram and waveforms, show that current lags voltage by 90° for a pure inductive circuit.	*CO2*	*PO1*	**08**
			OR			
2	a)		State and prove the condition of maximum power transfer as applied to DC circuits	*CO1*	*PO1*	**04**
	b)		Find the value of source E_2 so that the current I becomes zero. 	*CO2*	*PO1*	**08**
	c)		With phasor diagram and waveforms, show that current leads voltage by 90° for a pure capacitive circuit.	*CO2*	*PO1*	**08**
			UNIT - II			
3	a)		List the advantages of three phase ac systems over single phase ac systems	*CO1*	*PO1*	**04**
	b)		Demonstrate that current leads voltage in a series RC circuit, with relevant waveforms and phasor diagrams.	*CO2*	*PO1*	**08**
	c)		Determine the relationship between line and phase quantities of current and voltage in a balanced delta connected three-phase load.	*CO3*	*PO2*	**08**

			OR			
	4	a)	A coil takes a current of 10A when connected to a 200V, 50 Hz supply, and it dissipates 1200W. Find R, L and power factor of the coil.	*CO1*	*PO1*	**04**
		b)	A series RLC circuit is supplied with an AC voltage V at a frequency of f. Derive an expression for the current in the circuit for the following conditions (i) $X_L = X_C$ (ii) $X_L > X_C$ (iii) $X_L < X_C$ Draw the vector diagram indicating voltage and drops across different elements in the circuit.	*CO2*	*PO1*	**08**
		c)	Determine the relationship between line and phase quantities of current and voltage in a balanced star connected three-phase load.	*CO3*	*PO2*	**08**
			UNIT - III			
	5	a)	A four-pole DC machine, having wave-wound armature winding has 51 slots, each slot containing 20 conductors. What will be the EMF induced in the machine when driven at 1500 rpm assuming the flux per pole to be 7.0 mWb?	*CO3*	*PO2*	**04**
		b)	Explain the different types of losses occurring in a transformer and discuss how it can be minimized.	*CO2*	*PO1*	**08**
		c)	A 240V, 4 pole shunt motor running at 1000 rpm delivers 11kW with an armature current of 50 A and a field current of 1 A. The armature winding is wave connected and has 540 conductors. Its resistance is 0.1 Ω and drop at each brush is 1 V. Find (i) useful torque or net torque or shaft torque (ii) gross torque or armature torque (iii) useful flux per pole (iv) rotational losses or mechanical losses and (v) efficiency.	*CO3*	*PO2*	**08**
			OR			
	5	a)	The number of primary and secondary windings is 100 and 350 respectively. The primary voltage is given by 200V, determine the secondary voltage.	*CO3*	*PO2*	**04**
		b)	With relevant equations, explain N vs Ia and Ta vs Ia characteristics of a i) DC shunt motor. ii) DC series motor.	*CO2*	*PO1*	**08**
		c)	For a single-phase, 50 Hz, 150 KVA transformer, the voltage ratio is 5000/250 V. The full load copper loss is 1800 W and core loss is 1500 W. Determine: (i) the number of turns in each winding for a maximum core flux of 0.06 Wb (ii) the efficiency at half rated kVA, and 0.85 power factor (iii) the kVA load for maximum efficiency.	*CO3*	*PO2*	**08**

			UNIT - IV			
	7	a)	Differentiate between salient pole and non-salient pole rotors of a three-phase alternator.	*CO2*	*PO1*	**04**
		b)	A 3 phase, 4 pole induction motor is supplied from an alternator having 6 poles running at 1000 rpm. For the induction motor, calculate (i) synchronous speed (ii) rotor speed when slip is 0.06 (iii) frequency of rotor EMF when the speed is 750 rpm.	*CO3*	*PO2*	**08**
		c)	Derive an expression of induced EMF in a synchronous generator. Mention all terms related to that expression	*CO2*	*PO1*	**08**
			OR			
	8	a)	Compare squirrel cage rotor and phase wound rotor of an induction motor with its neat sketches.	*CO2*	*PO1*	**04**
		b)	A 4 pole, 3 phase, 50 Hz alternator has 18 slots per pole and 6 conductors per slot. A flux of 25 mWb is distributed sinusoidally along the air gap. If the alternator is star connected, determine the line EMF. Assume full pitched winding and distribution factor is 0.94.	*CO3*	*PO2*	**08**
		c)	What is rotating magnetic field? Explain with a phasor diagram for 0°and 60°.	*CO3*	*PO2*	**08**
			UNIT - V			
	9	a)	What is a Fuse? Differentiate Fuse with MCB (Any Three)	*CO4*	*PO6*	**04**
		b)	Define Earthing? What is the need of Earthing? With a neat diagram, Explain the construction and working of plate earthing.	*CO4*	*PO6*	**08**
		c)	With a neat schematic block diagram, discuss the major components of an electric vehicle.	*CO4*	*PO6*	**08**
			OR			
	10	a)	Define the following term:-i) fusing factor ii) current rating of fuse iii) fusing current.	*CO4*	*PO6*	**04**
		b)	Explain the structure of electric supply with a neat block diagram.	*CO4*	*PO6*	**08**
		c)	With neat circuit diagram explain working of Residual Current Circuit Breaker (RCCB).	*CO4*	*PO6*	**08**

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