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: 18EE1ESELE / 18EE2ESELE   Max Marks: 100
Course: Elements of Electrical Engineering
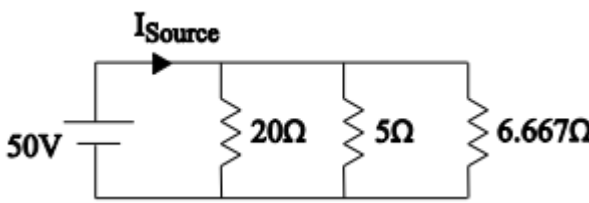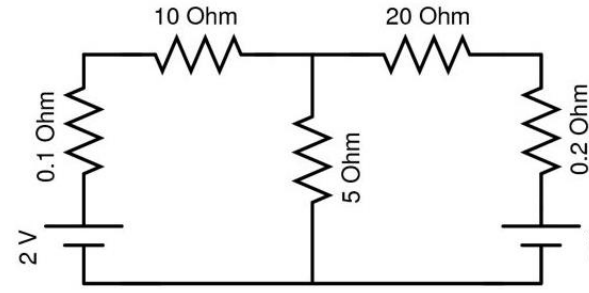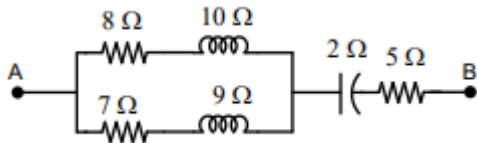
Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

				CO	PO	Marks
			UNIT - I	*CO*	*PO*	**Marks**
1	a)		Derive an expression for torque equation of a DC motor.	*CO1*	*PO1*	**06**
	b)		State and Explain super position theorem with suitable example.	*CO1*	*PO1*	**06**
	c)		For the circuit shown in Fig 1 (c), Find the value of I$_{source}$. Fig 1 (c)	*CO3*	*PO2*	**08**
			OR			
2	a)		What is back EMF in a DC motor? Derive for it.	*CO1*	*PO1*	**06**
	b)		For the circuit shown in Fig 2 (b), Find current in 5 ohms using superposition theorem. Fig 2 (b)	*CO3*	*PO2*	**08**
	c)		Define ohms law. Mention its limitations.	*CO1*	*PO1*	**06**
			UNIT - II			
3	a)		Derive and expression for RMS and Average value of a sinusoidal quantity.	*CO1*	*PO1*	**06**

				CO	PO	
	b)	Derive an expression for power for a series RL circuit. Represent with waveforms and phasor diagrams.		*CO2*	*PO1*	**06**
	c)	In the arrangement shown in the Figure 3.C. Calculate the impedance between AB Figure 3.C		*CO3*	*PO2*	**08**
		OR				
4	a)	Show that power consumption in a pure capacitor is zero when an AC voltage of applied across it. Represent with relevant waveforms and phasor diagrams.		*CO2*	*PO1*	**06**

	b)	Define the following with respect to AC circuit:
		   a. Cycle
		   b. Frequency
		   c. Time period
				CO2	*PO1*	**06**

	c)	When 1 A is passed through 3 air cored coil A, B, C in series, the voltage drops are respectively, 6, 3 and 8 V on direct current and 7, 5 and 10 V on alternating current. Find
		   (i) The power factor of each coil.
		   (ii) Power dissipated in each coil.
		   (iii) Power factor of the whole circuit.
				CO3	*PO2*	**08**

		UNIT - III				
5	a)	With relevant diagrams explain salient and non-salient pole synchronous generator.		*CO1*	*PO1*	**06**
	b)	With phasor diagrams, derive an expression for phase and line values in a balanced star connected three phase system.		*CO2*	*PO1*	**08**
	c)	Two wattmeter method is used to measure input power to a three-phase load. The load is found to consume total power of 30 kW at 0.7 pf (lagging). What are the readings of the two wattmeters?		*CO3*	*PO2*	**06**
		OR				
6	a)	Derive an expression for EMF of a three-phase synchronous generator.		*CO1*	*PO1*	**06**
	b)	Derive an expression for three phase power using two wattmeter method.		*CO2*	*PO1*	**06**
	c)	The three arms of a 3-phase load each comprise an inductor of resistance of 25 ohms & inductance of 0.15H in series with 120µF capacitor. Supply voltage is 415V, 50Hz.Calculate the line current and total power in watts, when the three arms are connected in delta.		*CO3*	*PO2*	**08**

			UNIT - IV			
7	a)		Derive the condition for maximum efficiency of a transformer.	*CO1*	*PO1*	**06**
	b)		With neat diagrams, explain shell type and core type transformers.	*CO2*	*PO1*	**06**
	c)		A single phase 25 kVA 1000/2000V, 50Hz transformer has efficiency of 98% at full load upf and half load 0.8 pf. Determine its efficiency at ¾th of its full load upf	*CO3*	*PO2*	**08**
			OR			
8	a)		Derive an emf equation for a transformer.	*CO2*	*PO1*	**06**
	b)		Explain different types of losses occurs in a transformer. How to reduce it?	*CO2*	*PO1*	**06**
	c)		A single phase 25 kVA 1000/2000V, 50Hz transformer has core loss of 450 W and full load copper loss of 850W. Determine its efficiency at a. $3/4^{th}$ of its full load 0.8 pf. b. $1/4^{th}$ of its full load upf.	*CO3*	*PO2*	**08**
			UNIT - V			
9	a)		Prove that the frequency of the induced emf in the rotor of an induction motor is slip times its stator supply frequency.	*CO1*	*PO1*	**06**
	b)		A 3 phase, 50 Hz, 6 pole induction motor has a full load percentage slip of 3%. Find: a) Synchronous speed; b) Actual speed of the motor.	*CO3*	*PO2*	**06**
	c)		Define earthing. Explain its necessity. With neat sketch explain plate earthing.	*CO4*	*PO6*	**08**
			OR			
10	a)		Explain the concept of rotating magnetic field for a induction motor.	*CO3*	*PO2*	**10**
	b)		Define fuse. With neat diagram explain HRC fuse.	*CO4*	*PO6*	**10**

******