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**
Branch: Electrical and Electronics Engineering   **Duration: 3 hrs.**
Course Code: 22EE1ESEEE   **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.

<table>
<tr><td colspan="3" align="center">UNIT - I</td><td><i>CO</i></td><td><i>PO</i></td><td>Marks</td></tr>
<tr><td>1</td><td>a)</td><td>State & explain the Kirchhoff's Laws with an example.</td><td><i>CO1</i></td><td><i>PO1</i></td><td>06</td></tr>
<tr><td></td><td>b)</td><td>A resistance of 10 Ω is connected in series with two resistances each of 15 Ω arranged in parallel. What resistance must be shunted across this parallel combination, so that the total current taken shall be 1.5 A with 20 V supply?</td><td><i>CO2</i></td><td><i>PO1</i></td><td>07</td></tr>
<tr><td></td><td>c)</td><td>With neat circuit and equations explain DC series and DC shunt motor.</td><td><i>CO3</i></td><td><i>PO2</i></td><td>07</td></tr>
<tr><td colspan="3" align="center">OR</td><td></td><td></td><td></td></tr>
<tr><td>2</td><td>a)</td><td>State & explain Ohm's Law. What are its limitations?</td><td><i>CO1</i></td><td><i>PO1</i></td><td>04</td></tr>
<tr><td></td><td>b)</td><td>Define back emf and derive for it. Mention its significance.</td><td><i>CO3</i></td><td><i>PO2</i></td><td>08</td></tr>
<tr><td></td><td>c)</td><td>A 4-pole DC motor is connected to a 500 V supply & takes armature current of 80 A. The resistance of the armature circuit is 0.4 Ω. The armature is wave wound with 522 conductors & the useful flux/pole is 0.025 wb. Calculate: i) Speed of the motor & ii) torque developed by the armature.</td><td><i>CO3</i></td><td><i>PO2</i></td><td>08</td></tr>
<tr><td colspan="3" align="center">UNIT - II</td><td></td><td></td><td></td></tr>
<tr><td>3</td><td>a)</td><td>Show that the average power absorbed by a pure capacitive circuit with sinusoidal excitation is zero. Also draw the waveforms of applied voltage, resulting current, power & the vector diagram for the above circuit.</td><td><i>CO3</i></td><td><i>PO2</i></td><td>08</td></tr>
<tr><td></td><td>b)</td><td>Define the following with respect to single phase AC waveforms: i)RMS value ii) Average value iii) form factor</td><td><i>CO1</i></td><td><i>PO1</i></td><td>06</td></tr>
<tr><td></td><td>c)</td><td>An inductive coil takes 10 A & dissipates 1000 W when connected to a supply at 250 V, 25 Hz. Calculate
  i) Impedance
  ii) resistance and inductance of the coil
  iii) power factor of the coil.</td><td><i>CO3</i></td><td><i>PO2</i></td><td>06</td></tr>
<tr><td colspan="3" align="center">OR</td><td></td><td></td><td></td></tr>
<tr><td>4</td><td>a)</td><td>Define and derive an expression for RMS value of a quantity.</td><td><i>CO1</i></td><td><i>PO1</i></td><td>06</td></tr>
</table>

		b)	Show that the average power absorbed by a pure inductive circuit with sinusoidal excitation is zero. Also draw the waveforms of applied voltage, resulting current, power & the vector diagram for the above circuit.	CO3	PO2	**08**
		c)	A coil having a resistance of 5 Ω and an inductance of 0.02 H is arranged in parallel with another coil having a resistance of 1 Ω and an inductance of 0.08 H. Calculate the total current and the total power absorbed when a voltage of 100 V at 50 Hz is applied across this combination.	CO3	PO2	**06**
			UNIT - III			
5		a)	What is the necessity & advantages of 3-phase over the single-phase circuits?	CO1	PO1	**06**
		b)	Obtain the relationship between the phase & line values of voltages & currents in a balanced star connected system.	CO3	PO2	**08**
		c)	Three identical impedances of (10+j15) Ω is connected in star. If the total current supplied is 15 A, what is the power drawn by the load?	CO3	PO2	**06**
			OR			
6		a)	With neat waveforms and equations explain how three phase waveforms are generated.	CO1	PO1	**06**
		b)	Obtain the relationship between the phase & line values of voltages & currents in a balanced delta connected system.	CO3	PO2	**08**
		c)	Three identical impedances are connected in delta to a 3 φ supply of 400 V. The line current is 35 A and the total power taken from the supply is 15 kW. Calculate the resistance and reactance values of each impedance	CO3	PO2	**06**
			UNIT - IV			
7		a)	Derive an emf equation of a single-phase transformer?	CO1	PO1	**06**
		b)	What are the various losses that occur in a transformer? Discuss the losses	CO1	PO1	**07**
		c)	The frequency of the emf in the stator of 4-pole induction motor is 50 Hz & in the rotor is 1.5 Hz. What is the slip & at what speed is the motor running?	CO3	PO2	**07**
			OR			
8		a)	Explain briefly the concept of rotating magnetic field developed in an induction motor.	CO3	PO2	**06**
		b)	Explain the constructional details of different types of rotors in 3-phase induction motor.	CO1	PO1	**08**

		c)	A 250 kVA, 11kV/415 V, 50 Hz 1-phase transformer has 80 turns on the secondary. Calculate:
			  i) The rated primary & secondary currents
			  ii) The no. of primary turns
			  iii)The maximum value of flux
				CO3	PO2	**06**

			UNIT - V			
9		a)	What is necessity of earthing of electrical equipment? explain with neat diagram any one method of earthing?	CO4	PO6	**08**

				CO4	PO6	

		b)	The domestic power load in a house comprises the following:
			8 lamps of 60W each, 3 fans of 70W each, 1 refrigerator of 200W,
			1 heater of 1000W.
			Calculate i) The total current taken from the supply of 230V.
			          ii) The energy consumed in a day
			          iii) The total energy consumed for the month of January
				CO4	PO6	**06**

		c)	What is electric shock? State the necessary safety precautions to be taken to avoid electric shock.	CO4	PO6	**06**
			OR			
	10	a)	With neat sketch explain RCCB.	CO4	PO6	**07**
		b)	Define fuse. With neat diagram Explain HRC fuse.	CO4	PO6	**06**
		c)	Define earthing. With neat diagram explain plate earthing.	CO4	PO6	**07**

******