U.S.N.										

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

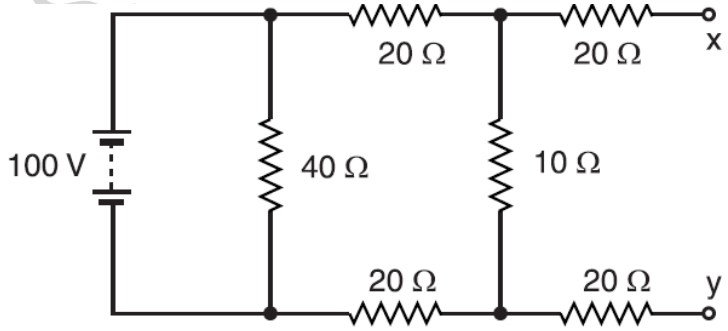
Autonomous Institute Affiliated to VTU

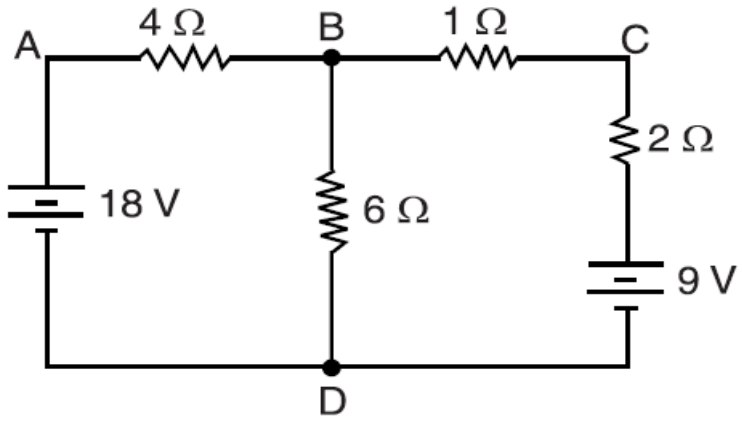
February / March 2024 Semester End Main Examinations

Programme: B.E. **Semester: I / II**
Branch: Common to all Branches **Duration: 3 hrs.**
Course Code: 22EE1ESIEE / 22EE2ESIEE **Max Marks: 100**
Course: Introduction to 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)		List the differences between conventional and non-conventional sources of energy.	*CO1*	*PO1*	**06**
	b)		With a neat schematic diagram, explain the hydroelectric power generation.	*CO1*	*PO1*	**06**
	c)		Wheatstone bridge ABCD has the following details; AB = 1000 Ω; BC = 100 Ω; CD = 450 Ω; DA = 5000 Ω. A Galvanometer of resistance 500 Ω is connected between B and D. A 4.5 V battery of negligible resistance is connected between A and C with A positive. Apply Kirchhoff's laws and find the magnitude and direction of Galvanometer current.	*CO1*	*PO1*	**08**
			UNIT - II			
2	a)		Calculate the power which would be dissipated in a 50 Ω resistor connected across xy in the network shown in Fig 2a using Thevenin's theorem  Fig.2a	*CO2*	*PO2*	**08**
	b)		State and Explain Faraday's Laws of Electromagnetic induction	*CO1*	*PO1*	**06**
	c)		A solenoid with 900 turns has a total flux of 1.33×10^{-7} Wb through its air core when the coil current is 100 mA. If the flux takes 75 ms to grow from zero to its maximum level, calculate the inductance of the coil. Also, calculate the induced EMF in the coil during the flux growth.	*CO2*	*PO2*	**06**

			OR			
	3	a)	Find the currents in the various branches of the circuit shown in Fig 3a using superposition theorem  Fig.3a	*CO2*	*PO2*	**08**
		b)	Explain statically induced EMF.	*CO1*	*PO1*	**06**
		c)	Two coils, A of 12,500 turns and B of 16,000 turns, lie in parallel planes so that 60 % of flux produced in A links coil B. It is found that a current of 5A in A produces a flux of 0.6mWb while the same current in B produces 0.8 mWb. Determine (i) mutual inductance and (ii) coupling co-efficient.	*CO2*	*PO2*	**06**
			UNIT - III			
	4	a)	With a neat sketch of voltage and current waveforms and phasor diagram, explain the behavior of RLC circuit for AC Voltage.	*CO2*	*PO2*	**10**
		b)	Define the terms with expressions: a) RMS value. b) Average value. c) Phase angle. d) Amplitude value. e) Form Factor.	*CO1*	*PO1*	**10**
			UNIT - IV			
	5	a)	Derive the EMF equation of a transformer.	*CO2*	*PO2*	**07**
		b)	A single phase 100 kVA transformer has 500 turns in the primary and 1200 turns in the secondary. The cross-sectional area of the core is 80 sq. cm. If the primary winding is connected to a 50 Hz supply at 500 V, calculate **(i)** Peak flux-density, and **(ii)** Voltage induced in the secondary **(iii)** Primary and Secondary currents.	*CO2*	*PO2*	**06**
		c)	Obtain an expression for armature torque in a DC motor.	*CO2*	*PO2*	**07**
			OR			
	6	a)	With a neat sketch explain the construction and working of a DC motor.	*CO1*	*PO1*	**07**
		b)	A 200-kVA transformer has an efficiency of 98% at full load. If the maximum efficiency occurs at three quarters of its full-load,	*CO2*	*PO2*	**08**

<table>
<tr><td></td><td></td><td></td><td>calculate the efficiency at half load. Assume negligible magnetizing current and p.f. 0.8 at all loads.</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>c)</td><td>A DC series motor takes an armature current of 110 A at 480 V. The armature circuit and series field resistance together is 0.2 Ω. The machine has 6-poles and the armature is lap-connected with 864 conductors. The flux per pole is 0.05 Wb.
Calculate: (i) Speed and
(ii) Gross torque developed by the armature.</td><td>CO2</td><td>PO2</td><td>05</td></tr>
<tr><td></td><td></td><td></td><td>UNIT - V</td><td></td><td></td><td></td></tr>
<tr><td>7</td><td></td><td>a)</td><td>List the demerits of fuse and with a neat sketch explain the working principle of Miniature Circuit Breaker (MCB).</td><td>CO3</td><td>PO6</td><td>06</td></tr>
<tr><td></td><td></td><td>b)</td><td>A household has different electrical appliances which run for a certain duration in a day.
<table>
<tr><th>Sl. No</th><th>Appliance</th><th>Power rating (W)</th><th>Quantity</th><th>No. of Hours per day</th></tr>
<tr><td>1</td><td>Water Geyser</td><td>2000</td><td>2</td><td>1</td></tr>
<tr><td>2</td><td>TV</td><td>100</td><td>1</td><td>10</td></tr>
<tr><td>3</td><td>Lamps</td><td>40</td><td>5</td><td>6</td></tr>
<tr><td>4</td><td>Fan</td><td>60</td><td>2</td><td>10</td></tr>
<tr><td>5</td><td>Laptop</td><td>150</td><td>1</td><td>10</td></tr>
<tr><td>6</td><td>Fridge</td><td>500</td><td>1</td><td>2</td></tr>
<tr><td>7</td><td>Washing Machine</td><td>1000</td><td>1</td><td>1</td></tr>
</table>
If a 3 kW Energy Meter is installed in the house, cost/kW is Rs.100/- and cost/unit is Rs.7/-. Calculate the electricity bill for the month of Jan 2023.</td><td>CO3</td><td>PO6</td><td>08</td></tr>
<tr><td></td><td></td><td>c)</td><td>With a neat block diagram explain the operation of Electric Vehicle.</td><td>CO2</td><td>PO2</td><td>06</td></tr>
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