Total No. of Questions – [4]

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G.R./PRN No.	

PAPER CODE	U123 - 203A (RF)

MAY 2023 (INSEM + ENDSEM) EXAM

F.Y. B. TECH. (SEMESTER – II)

COURSE NAME: Basic Electrical Engineering

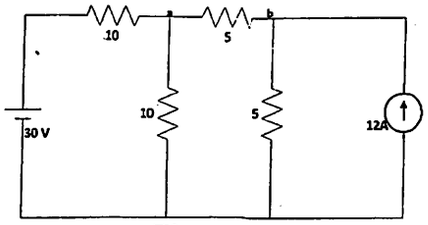
COURSE CODE: ET10203A

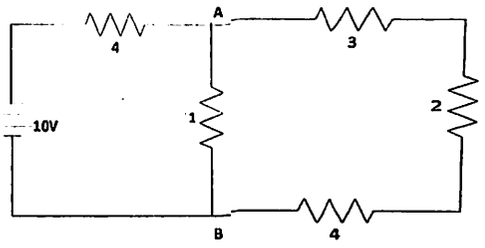
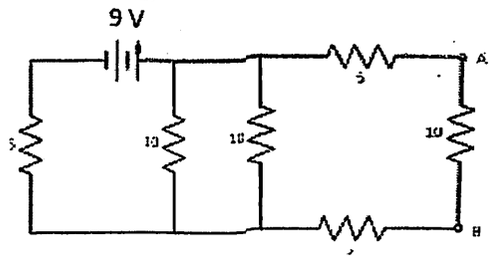
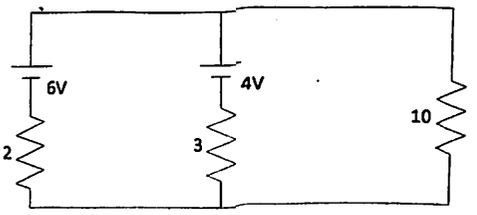
(PATTERN 2020)

Time: [2Hr] [Max. Marks: 60]

(*) Instructions to candidates:

1) **Figures to the right indicate full marks.**
2) **Use of scientific calculator is allowed**
3) **Use suitable data wherever required**

Question No.	Question Description	Marks	CO mapped	Blooms Taxonomy Level
Q.1	**Solve the following**			
	i) The current flowing through the branch ab is _____when 30 V source acting alone for the circuit shown in Figure 1.  Figure 1 (a) 2 A (b) 3 A (c) 1 A (d) 0	[2]	CO1	Apply
	ii) The current flowing through the branch ab is _____when 12 A source acting alone for the circuit shown in Figure 1. (a) 2 A (b) 3 A (c) 1 A (d) 4 A	[2]	CO1	Apply
	iii) While applying Thevenin's Theorem to a given network, the equivalent resistance is obtained by_____ (a) Shorting all voltage sources (b) Opening all current sources (c) Shorting all voltage sources and opening all current sources (d) Opening all voltage sources and shorting all current sources	[2]	CO1	Understand
	iv) An ideal voltage source is one that _____ (a) has high internal resistance (b) provides constant voltage irrespective of current (c) supplies constant current (d) delivers constant power	[2]	CO1	Understand

	v) Find the Thevenin's Voltage source value when branch AB acts as the load for the circuit shown in Figure 2. All resistance values are in Ω.  Figure 2 (a) 6.92 V (b) 3.08 V (c) 10 V (d) 2 V	[2]	CO1	App
	vi) What is the value of equivalent resistance observed from terminals A and B in case of the circuit shown in Figure 3? All resistance values are in Ω.  Figure 3 (a) 10 Ω (b) 12.5 Ω (c) 3.75 Ω (d) 20 Ω	[2]	CO1	Apply
	vii) What is the value of Thevenin's Voltage when 10 Ω is opened as a load resistance in case of the circuit shown in Figure 4? All resistance values are in Ω.  Figure 4 (a) 10 V (b) 2 V (c) 5.2 V (d) 4.8 V	[2]	CO1	Apply
	viii) The current in 10 Ω resistance for the circuit shown in Figure 4 will be (a) 4.33 A (b) 0.52 A (c) 0.557 A (d) 0.464 A	[2]	CO1	Apply
	ix) Two sinusoidal voltages are given by $e_1 = 10\sqrt{2}\sin\left(\omega t + \frac{\pi}{2}\right) V$ and $e_2 = 20\sqrt{2}\cos(\omega t)\ V$, the ratio of form factor of e_1 to e_2 is (a) 2 (b) 1.11 (c) 1 (d) 0.5	[2]	CO2	Apply
	x) The voltage in a circuit is given as $v = 100\ sin\omega t$ V. If the frequency is 50 Hz, how long will it take for the voltage to rise to 50 V? (a) 20 mS (b) 10 mS (c) 3.33 mS (d) 1.66 mS	[2]	CO2	Apply

	xi) The average values of two sinusoidal currents are $I_{1avg} = \frac{10}{\pi}$ A and $I_{2avg} = \frac{20}{\pi}$ A, then the ratio rms value of I_2 to I_1 is (a) 1 (b) 2 (c) 0.5 (d) cannot be determined	[2]	CO2	Underst and
	xii) The instantaneous voltage is given by $v = 200\sqrt{(2)}\sin\left(\omega t - \frac{\pi}{2}\right)$ V with frequency 50 Hz. The voltage at $(1/6)^{th}$ cycle is given by____ V. (a) 200 (b) -141.42 (c) 141.42 (d) -200	[2]	CO2	Apply
	xiii) The voltage and current in a circuit are given as $V = 230\angle 30^{\circ}$ V and $I = 2 \angle 15^{\circ}$A. If the circuit works at 50 Hz, the power factor of the circuit will be (a) 0.866 lead (b) 0.965 lag (c) 0.707 lag (d) 0.707 lead	[2]	CO2	Apply
	xiv) The instantaneous currents are given by $i_1 = 10\sqrt{(2)}\sin\left(100\pi t - \frac{\pi}{2}\right)$ A and $i_2 = 20\sqrt{(2)}\sin\left(120\pi t - \frac{\pi}{6}\right)$ A. The ratio of time period of current i_1 to the time period of current i_2 is (a) 5/6 (b) 6/5 (c) 1.11 (d) 1	[2]	CO2	Apply
	xv) The rms value of voltage is $\frac{400}{\sqrt{(2)}}$ V and instantaneous voltage at t = 0 is 400 V. Then equation of voltage is given by (a) $v = 400\sin(\omega t)$ (b) $v = 400\sin(\omega t - \frac{\pi}{2})$ (c) $v = 400\sin(\omega t + \frac{\pi}{2})$ (d) $v = 400\sqrt{(2)}\sin(\omega t + \frac{\pi}{2})$	[2]	CO2	Apply
Q2	**Solve any three out of four**			
	a) Draw the hysteresis loop of a ferromagnetic material and show residual magnetic flux density and coercive force in it. State the losses taking place in magnetic core of a transformer.	[5]	CO3	Underst and
	b) Derive the emf equation of a single phase transformer. Also state the properties of an ideal transformer.	[5]	CO3	Underst and
	c) A 25 kVA single phase transformer working at full load unity power factor has an efficiency of 94 %. The same efficiency is maintained when the transformer works at half load and 0.9 power factor. Determine the iron loss and full load copper loss.	[5]	CO3	Apply
	d) In a 50 kVA, 1100V/220V single phase transformer, the iron and copper losses at full load are 350 W and 425 W respectively. Calculate the efficiency at (i) Full load with unity power factor (ii) Half load with unity power factor	[5]	CO3	Apply

Q.3	**Solve any three out of four**			
	a) Prove that a 3- phase, delta connected load consumes three times as much power as consumed by a star connected load.	[5]	CO4	Apply
	b) The electrical installation in a house is utilized as mentioned below: i) 5 Tube lights, 18 W each, for 10 hrs. a day ii) 6 ceiling fans, 60 W each, for 8 hrs. a day iii) 1 electric oven of 1.2 KW for 30 minutes a day iv) 2 electric geysers, 1.5 KW each for 1 hr a day. Calculate the total cost of energy at the rate of Rs.7 per unit for 30 days.	[5]	CO4	Apply
	c) What is energy conservation? Suggest suitable measures for energy conservation in the house described in the above Q.3 b).	[5]	CO4	Underst and
	d) A balanced 3-phase star connected load of 150 kW takes a leading current of 100 A with a line voltage of 1100 V, 50 Hz. Find the per phase values of the circuit elements of the load.	[5]	CO4	Apply