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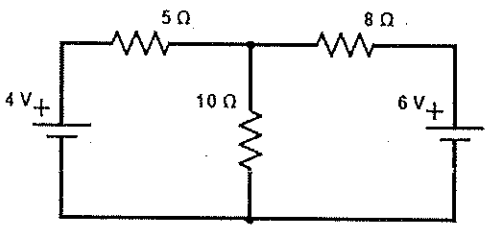
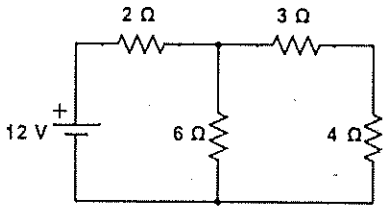
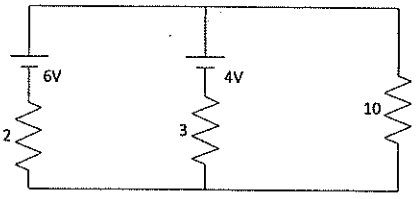
F.Y.B. TECH. (SEMESTER -II)

COURSE NAME: Basic Electrical Engineering | **Branch: Electronics and Telecommunication Engineering (PATTERN 2023)** | **COURSE CODE:ET12233**

Time: [2Hrs.] **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 where ever required**
4) **All questions are compulsory. Solve any three sub questions each from each Question 1, 2, 3 and 4 respectively.**

Que. No.	Question Description	Max. Marks	CO mapped	BT Level
Q1.	**Solve any three sub questions from the following**			
	a) State and explain Kirchhoff's Current law (KCL) and Kirchhoff's voltage law (KVL) along with sign conventions used.	[5]	CO1	Understand
	b) Calculate the current in 5 Ω in the circuit as shown in figure 1.  **Figure 1**	[5]	CO1	Apply
	c) Find the voltage drop across 4 Ω resistance for the circuit shown in figure 2.  **Figure 2**	[5]	CO1	Apply
	d) Find the current flowing through 10 Ω resistance for the circuit shown in figure 3 using Thevenin's theorem.  **Figure 3**	[5]	CO1	Apply
Q2.	**Solve any three sub questions from the following**			

	a) In a circuit, the applied voltage is 100 V and is found to lag the circuit current of 10 A by 30^0. i) Is the power factor leading or lagging or unity? ii) What is value of power factor? iii) Is the circuit nature capacitive or inductive? iv) What is the value of active and reactive power of the circuit?	**[5]**	CO2	Apply
	b) Derive an expression for current drawn and the average power consumed by a circuit consisting of a pure inductor of inductance 'L' connected across an ac source of $v = V_m \sin\omega t$.	**[5]**	CO2	Under stand
	c) A series circuit consisting of a resistance of 20 Ω, inductance of 0.2 H and capacitance of 150 μF across a 230V, 50 Hz single-phase ac supply. Find: i) inductive and capacitive reactance ii) impedance and admittance of circuit and iii) power factor of circuit.	**[5]**	CO2	Apply
	d)A series RLC circuit has R = 5 Ω, L= 0.2 H and C = 50 μF. The applied voltage to circuit is 200 V. Calculate: - i) resonant frequency ii) current at resonance and iii) voltage across resistor, inductor and capacitor at resonance.	**[5]**	CO2	Under stand
Q3.	**Solve any three sub questions from the following**			
	a) Derive the condition for maximum efficiency and expression for load kVA supplied at maximum efficiency for a two- winding transformer.	**[5]**	CO3	Apply
	b) A 45 kVA, 6000/200 V, single- phase transformer has primary and secondary resistance of 8 Ω and 0.01 Ω respectively. The leakage reactance referred to primary side is 30 Ω. Determine the percentage voltage regulation at full-load, 0.6 power factor lagging.	**[5]**	CO3	Apply
	c) In a 50 kVA, 1100/200V, 50 Hz, single-phase transformer, iron and copper losses at full load are 370 W and 440 W respectively. Calculate: i) percentage efficiency at full load, 0.6 leading power factor ii) maximum efficiency and kVA at which maximum efficiency takes place.	**[5]**	CO3	Apply
	d) A 55 kVA, single- phase transformer has primary winding of 460 turns and secondary winding of 160 turns. The input side of transformer is supplied with 2500 V. Calculate: i) Secondary voltage ii) primary and secondary full load current and iii) maximum flux in the core.	**[5]**	CO3	Apply
Q4.	**Solve any three sub questions from the following**			
	a) Draw a neat phasor diagram for a three-phase balanced delta-connected resistive load in each phase across a symmetrical three-phase ac supply and hence derive the relationship between the line current and phase current. Also write relation between line voltage and phase voltage.	**[5]**	CO4	Apply
	b) Two-wattmeter method is used to determine the input power to a three- phase balanced load. The readings are found as 5.2 kW and -1.7 kW, when the applied line voltage is 415 V. Calculate i) the total power ii) the power factor, and iii) the line current.	**[5]**	CO4	Apply
	c) Calculate the phase and line currents in a balanced delta-connected load taking 75 kW at a power factor of 0.8 lagging from a 3-phase, 440 V supply. Also calculate the total reactive power in the circuit.	**[5]**	CO4	Apply
	d) Three coils, each having a resistance of 20 Ω and an inductive reactance of 15 Ω are connected in star across 400 V, 3-phase, 50 Hz supply. Calculate i) line current ii) power factor iii) active power	**[5]**	CO4	Apply