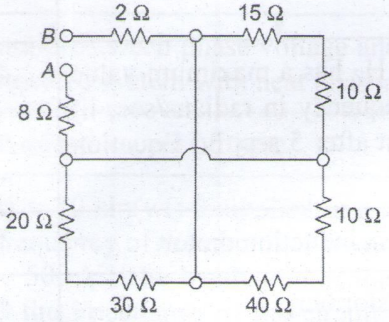
K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

Dec 2023 Scheme II
(B.Tech.) Program: All Branches
Examination: FY Semester: I
Course code: BSC105 Course Name: Basic Electrical Engineering
Date of Exam: Duration: 2.30 Hours Max. Marks: 60

Instructions:
(1) All questions are compulsory.
(2) Draw neat diagrams wherever applicable.
(3) Assume suitable data, if necessary.

		Max. Marks	CO	BT level
Q 1	Solve any six questions out of eight:	12		
i)	Find the resistance between terminal A & B. 	2	CO1	App
ii)	Derive the formula for resonant frequency of a series resonant circuit.	2	CO2	An
iii)	State and Explain Superposition theorem with example.	2	CO1	R
iv)	An alternating voltage of (80 + j 60) V is applied to a circuit and the current flowing is (4 – j 2) A. Find the (i) impedance (ii) phase angle (iii) power factor and (iv) power consumed	2	CO2	App
v)	In a balanced three phase circuit, the power is measured by two wattmeter's the ratio of wattmeter reading is 4: 1. Determine load power factor.	2	CO3	App
vi)	Compare star and delta connections in three phase circuits.	2	CO3	An
vii)	Explain losses in the transformer.	2	CO4	U
viii)	What will be the secondary voltage at no load, if the primary of a 5 kVA, 220/110 V, 50 Hz transformer is fed at (i) 110 V, 50 Hz, and (ii) 150 V, 50 Hz.	2	CO4	App
Q.2	Solve any four questions out of six.	16		

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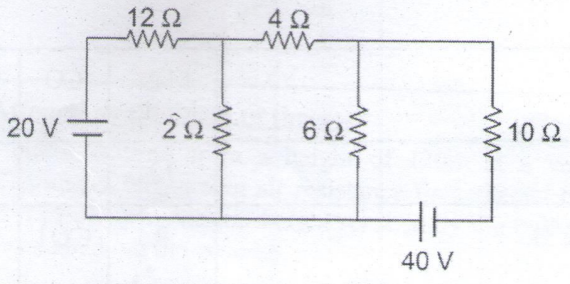
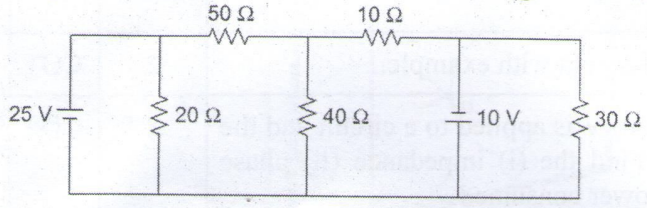
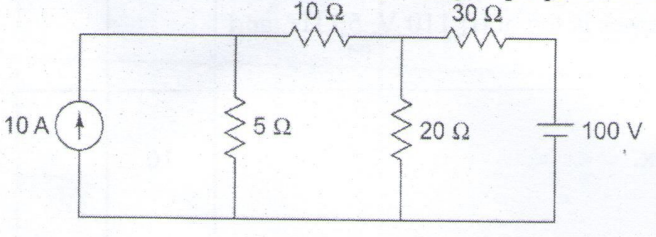
i)	Find the value of current flowing through the 10 Ω resistor by using Norton's theorem. 	4	CO1	App
ii)	An alternating current of frequency of 50 H_Z has a maximum value of 12A. Find the following i) Angular frequency in radians/sec, ii) RMS value of current, iii) Value of current after 5 sec, iv) Equation of instantaneous value of current.	4	CO2	App
iii)	Explain principle of operation of three phase induction motor.	4	CO5	R
iv)	Derive EMF equation for single phase transformer.	4	CO4	An
v)	Using Nodal analysis find the current through 40Ω resistors. 	4	CO1	App
vi)	A balanced 3-phase load consists of 3 coils, each of resistance 6Ω and X_L= 6Ω. Determine the phase impedance, phase voltage, phase current, line current and load power factor when the load is connected across 400V, 50H_Z supply.	4	CO3	App
Q.3	Solve any two questions out of three.	16		
i)	Find the current 10Ω through by using Superposition theorem. 	8	CO1	App

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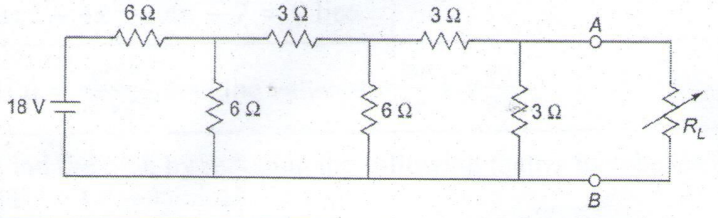
ii)	A 30 kVA, 2400/120 V, 50 Hz, transformer has a high-voltage winding resistance of 0.1 Ω and a leakage reactance of 0.22 Ω. The low-voltage winding resistance is 0.035 Ω, and the leakage reactance is 0.012 Ω. Calculate for the transformer: (i) Equivalent resistance as referred to both primary and secondary (ii) Equivalent reactance as referred to both primary and secondary (iii) Equivalent impedance as referred to both primary and secondary (iv) Copper loss at full load	8	CO4	App
iii)	Prove the relation between phase voltage and line voltage in a three phase star connected system with neat phasor diagram.	8	CO3	App
Q.4	Solve any two questions out of three.	16		
i)	A voltage v(t) = 10 sin(wt) is applied to a series R-L-C circuit. At the resonant frequency of the circuit, the voltage across the capacitor is found to be 500 V. The bandwidth of the circuit is known to be 400 rad/s and the impedance of the circuit at resonance is 100 Ω. Determine inductance and capacitance resonant frequency, upper and lower cut-off frequencies.	8	CO2	App
ii)	Find the value of the load resistance R_L for max. power transfer and calculate the maximum power. 	8	CO1	App
iii)	Two impedances, one inductive and the other capacitive, are connected in series across the voltage of (120<30°) V and a frequency of 50 Hz. The current flowing in the circuit is 3<15°A. If one of the impedances is (10 + j48.3) Ω, find the other. Also calculate the values of L and C in the impedances.	8	CO2	App

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