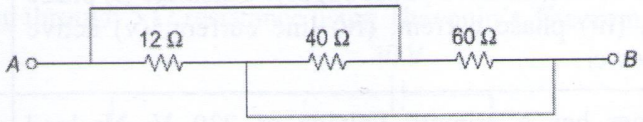
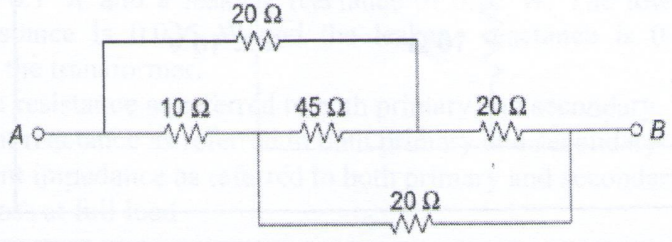
K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

Supplementary Exam (Feb/Mar 2024)

Program: B.Tech Scheme III
Examination: FY Semester: I
Course Code: BSC105 and Course Name: Basics of Electrical Engineering

Date of Exam: 05-03-24 Duration: 2.5 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)	State and explain Kirchoff's laws	2	CO1	R
ii)	What is the equivalent resistance between terminal A and B? 	2	CO1	Ap
iii)	Define average value, root mean square value of alternating quantity.	2	CO2	U
iv)	Explain AC applied to series R-L circuits. Draw voltage and impedance triangle.	2	CO2	U
v)	List advantages of a three phase system over a single-phase system.	2	CO3	U
vi)	What are the losses in the transformer?	2	CO4	U
vii)	Explain working principle of three phase Induction Motor	2	CO5	U
viii)	Explain the double field revolving theory of single phase Induction Motor.	2	CO6	U
Q.2	Solve any four questions out of six.	16		
i)	Find equivalent resistance between terminal A and B. 	4	CO1	Ap

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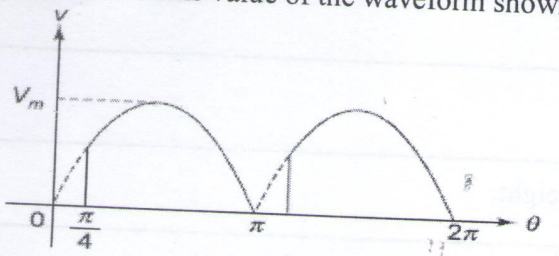
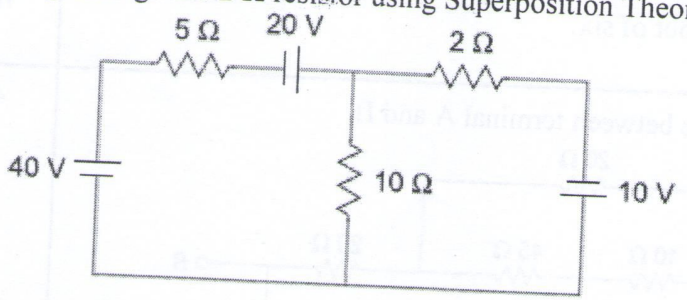
ii)	Find the average value and rms value of the waveform shown in Fig 	4	CO2	Ap
iii)	Three equal impedances, each of (8 + j10) Ω, are connected in star. This is further connected to a 440 V, 50 Hz, three-phase supply. Calculate (i) phase voltage, (ii) phase angle, (iii) phase current, (iv) line current, (v) active power, and (vi) reactive power.	4	CO3	Ap
iv)	A single-phase transformer has a primary voltage of 230 V. No-load primary current is 5 A. No-load pf is 0.25. Number of primary turns are 200 and frequency is 50 Hz. Calculate (i) maximum value of flux in the core, (ii) core loss, and (iii) magnetizing current.	4	CO4	Ap
v)	Draw and explain Torque-speed characteristics of three phase Induction Motor.	4	CO5	U
vi)	With the help of neat diagram explain the construction of single-phase induction motor	4	CO6	U
Q.3	Solve any two questions out of three.	16		
i)	Find I flowing through the 2 Ω resistor using Superposition Theorem. 	8	CO1	Ap

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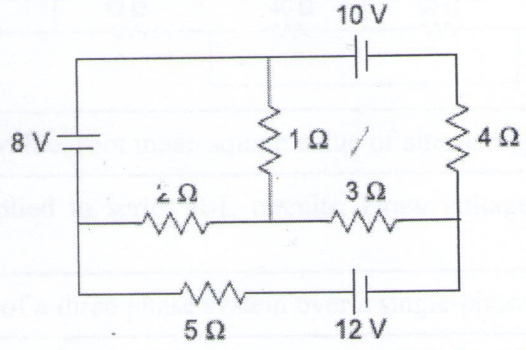
ii)	A pure resistor R, a choke coil and a pure capacitor of 15.91 mF are connected in series across a supply of V volts and carries a current of 0.25 A. The voltage across the choke coil is 40 V, the voltage across the capacitor is 50 V and the voltage across the resistor is 20 V. The voltage across the combination of R and the choke coil is 45 V. Calculate (i) supply voltage, (ii) frequency, and (iii) power loss in the choke coil.	8	CO2	Ap
iii)	A delta-connected three-phase load is supplied from a 3-phase, 400 volts balanced supply system. The line current is 20 A and power taken by the load is 10 kW. Find (i) impedance in each branch, (ii) line current, (iii) power factor and (iv) power consumed if the same load is connected in star.	8	CO3	Ap
Q.4	Solve any two questions out of three.	16		
i)	Find I flowing through 5 Ω resistance using Thevenin's Theorem. 	8	CO1	Ap
ii)	An R-L-C series circuit with a resistance of 20 ohms, inductance of 0.4 H and a capacitance of 80 μF is supplied with a 200 V supply at variable frequency. Find the following w.r.t. the series resonant circuit: (i) frequency at which resonance takes place (ii) current (iii) power (iv) power factor (v) voltage across R-L-C at that time (vi) quality factor (vii) half-power points (viii) resonance and phasor diagrams	8	CO2	Ap
iii)	A 30 kVA, 2400/120 V, 50 Hz, transformer has a high-voltage winding resistance of 0.1 W and a leakage reactance of 0.22 W. The low-voltage winding resistance is 0.035 W and the leakage reactance is 0.012 W. 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	Ap