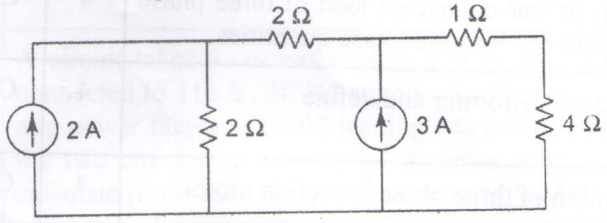
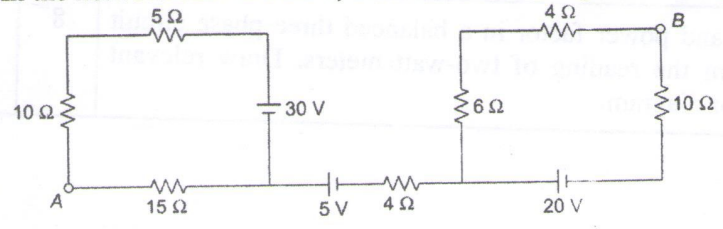
K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

Nov – Dec 2022
(B.Tech) Program: All Branches
Examination: FY Semester: I
Course code: BSC105 Course Name: Basic Electrical Engineering
Date of Exam: 01-03-2023 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)	State and Explain Superposition theorem with example.	2	CO1	R
ii)	Find the voltage across the 4 Ω resistor by source transformation. 	2	CO1	App
iii)	An alternating voltage is represented by v = 141.4 sin 377t. Find (i) max-value (ii) rms value (iii) time period (iv) frequency	2	CO2	App
iv)	A voltage v(t) = 177 sin (314t + 10°) is applied to a circuit. It causes a steady-state current to flow, which is described by i(t) = 14.14 sin (314t – 20°). Determine the power factor and average power delivered to the circuit.	2	CO2	App
v)	Compare star and delta connected load in three phase supply system.	2	CO3	App
vi)	Explain working principle of transformer.	2	CO4	R
vii)	A 250 kVA, 50 Hz single-phase transformer has transformation ratio of 0.1, the secondary voltage at no-load condition is 240 V. Calculate (i) primary voltage and (ii) fullload primary and secondary currents.	2	CO4	App
viii)	What is concept of slip in three phase induction motor?	2	CO5	R
Q.2	Solve any four questions out of six.	16		
i)	In the network shown below, determine the voltage between points A and B. 	4	CO1	App

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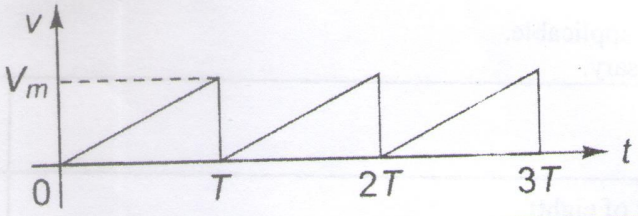
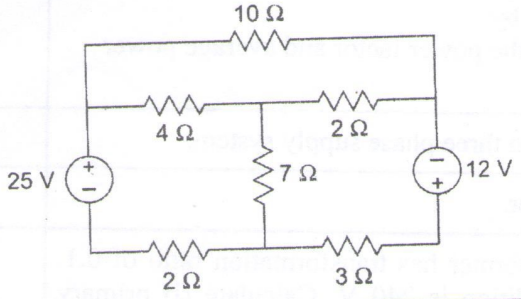
ii)	Determine Average and RMS value of the following waveform. 	4	CO2	App
iii)	A voltage of 125 V at 50 Hz is applied across a resistor connected in series with a capacitor. The current is 2.2 A. The power loss in the resistor is 96.8 W. Calculate the resistance and capacitance values.	4	CO2	App
iv)	Draw the complete phasor diagram of star connected load of three phase supply system and derive relation between line and phase quantities.	4	CO3	App
v)	Derive emf equation for single phase transformer and define transformation ratio.	4	CO4	App
vi)	Explain working principle of operation of three phase induction motor.	4	CO5	U
Q.3	Solve any two questions out of three.	16		
i)	Determine the current through 10 Ω by using thevenin's theorem. 	8	CO1	App
ii)	An R-L-C series circuit with a resistance of 20 Ω, 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	App
iii)	Prove that the power and power factor in a balanced three phase circuit can be calculated from the reading of two-watt meters. Draw relevant connections and phasor diagram.	8	CO3	App

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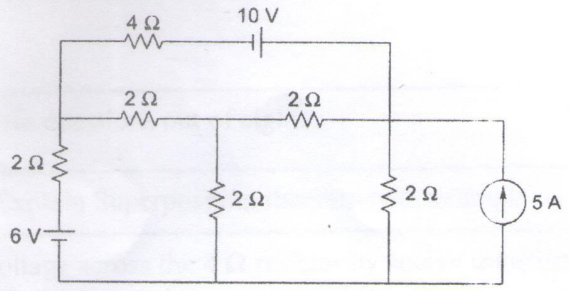
Q.4	Solve any two questions out of three.	16		
i)	Determine the current through 4 Ω by using Nodal analysis. 	8	CO1	App
ii)	A circuit takes a current of 4 A at a power factor of 0.6 lagging when connected to 115 V, 50 Hz supply. Another circuit takes a current of 6 A at a power factor of 0.707 leading when connected to the same supply. If the two circuits are connected in series across a 230 V, 50 Hz supply, calculate (i) current, (ii) power consumed, and (iii) power factor	8	CO2	App
iii)	A 60 kVA, 4400/220 V transformer has R_1 = 3.45 Ω, R_2 = 0.009 Ω. The reactances are X_1 = 5.2 Ω and X_2 = 0.015 Ω. Calculate for the transformer, (i) full-load currents on primary and secondary side, (ii) equivalent resistances, reactances, impedances referred to primary side and secondary side, and (iii) total copper loss using individual resistances and equivalent resistances.	8	CO4	App

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