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SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)
B.Tech. I Year II Semester Regular & Supplementary Examinations June-2025
ELECTRICAL CIRCUITS ANALYSIS-I
(Electrical & Electronics Engineering)

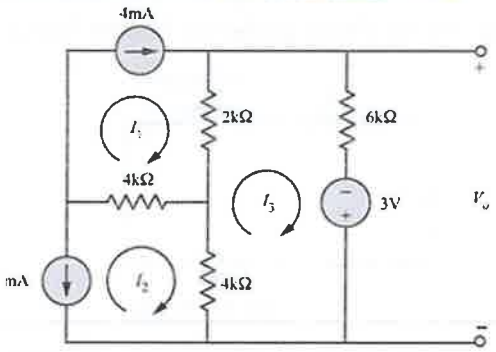
Time: 3 Hours **Max. Marks: 70**

PART-A
(Answer all the Questions **10 x 2 = 20** Marks)

1	a	Define Independent source and Dependent sources	CO1	L2	2M
	b	Write the characteristics of series connection of resistances.	CO1	L2	2M
	c	What is Magnetic Motive Force (MMF) in Electrical Engineering?	CO2	L2	2M
	d	State dot rule for coupled coils.	CO2	L1	2M
	e	Write the impedance equation for series RL, RC, RLC and parallel RL, RC, RLC.	CO3	L1	2M
	f	A load consisting of 3Ω resistance and 4 Ω inductive reactance draw a current of 10 A when connected to a sinusoidal source. Determine the voltage and power in the load.	CO3	L2	2M
	g	How is the resonant frequency related to half-power frequencies in RLC series/parallel circuits?	CO4	L1	2M
	h	Write the expression for the quality factor of the series and parallel RLC circuit.	CO4	L2	2M
	i	State superposition theorem.	CO5	L2	2M
	j	Draw the equivalent circuit of Norton's Theorem and Thevenin's theorem.	CO5	L1	2M

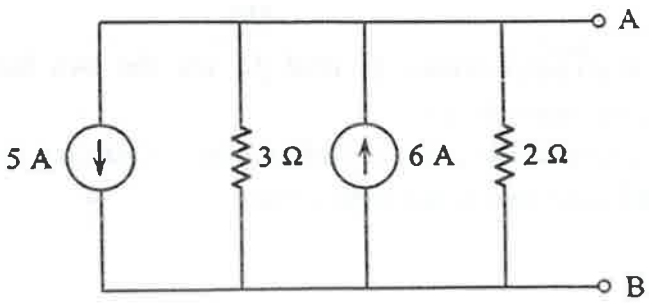
PART-B
(Answer all Five Units 5 x 10 = 50 Marks)
UNIT-I

2	a	Develop transformation formulae for Star to Delta transformation.	CO1	L1	5M
	b	Find the voltage V0 in the circuit shown in	CO1	L2	5M



OR

3	a	Explain about Source transformation technique.	CO1	L2	5M
	b	Convert the current source into equivalent voltage sources	CO1	L4	5M



UNIT-II

4	a	Derive an expression for coefficient coupling.	CO2	L3	5M
	b	Two coils connected in a series-aiding manner have a total inductance of 275 mH. When connected in a series-opposing configuration, the coils have a total inductance of 125 mH. If the inductance of one coil (L1) is three times the other, find L1, L2, and M. What is the coupling coefficient?	CO2	L2	5M

OR

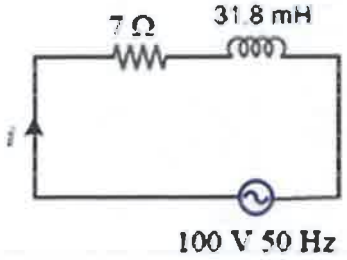
5	a	Explain the concept of Series and Parallel Magnetic Circuits.	CO2	L2	5M
	b	A coil having an inductance of $100mH$ is magnetically coupled to another coil having an inductance of $900mH$. The coefficient of coupling between the coils is 0.45. calculate the equivalent inductance if the two coils are connected in (i) series aiding, (ii) series opposing, (iii) parallel aiding, and (iv) parallel opposing.	CO2	L2	5M

UNIT-III

6	a	Determine the series RLC circuit excited by a sinusoidal source	CO3	L4	5M
	b	A 230V, 50Hz ac supply is applied to a coil of 0.06H inductance and 2.5Ω resistance connected in series with a 6.8μF capacitor. Calculate (i) impedance (ii) current (iii) phase angle between current and voltage (iv) power factor (v) power consumed.	CO3	L2	5M

OR

7	a	Describe the sinusoidal function and explain the phasor and phasor diagram concepts.	CO3	L5	6M
	b	A resistance of 7Ω is connected in series with a pure inductance of 31.8 mH and the circuit is connected to a 100 V, 50 Hz sinusoidal supply. Calculate i) circuit current ii) Phase angle iii) Power factor iv) Power.	CO3	L2	4M



UNIT-IV

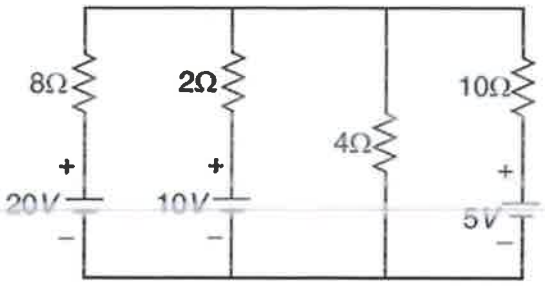
8	a	Draw the Locus diagram of a Series RL Circuit.	CO4	L2	6M
	b	Obtain an expression for resonant frequency in a parallel resonant circuit.	CO4	L2	4M

OR

9	a	Prove that $f_0 = \sqrt{(f_1 f_h)}$ where fl and fh are the two half power frequencies of a resonant circuit.	CO4	L4	5M
	b	A RLC series circuit of R=16Ω, L=5mH, C=2μF. Calculate the quality factor, bandwidth, and half-power frequencies.	CO4	L2	5M

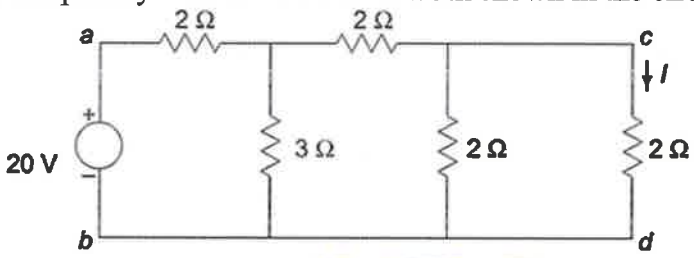
UNIT-V

10	a	State Milliman's theorem and derive an expression for Milliman's equivalent source of n number of parallel connected voltage sources.	CO5	L2	5M
	b	Using Millman's theorem, find current through 4Ω resistance for the following circuit.	CO5	L4	5M

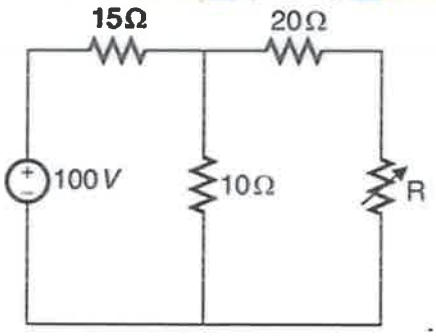


OR

11	a	Verify the reciprocity theorem for the network shown in the circuit.	CO5	L2	5M



	b	In the circuit shown, find the value of adjustable resistor R for maximum power transfer to R. Also, calculate the maximum power.	CO5	L2	5M



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