U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

April 2025 Semester End Make-Up Examinations

Programme: B.E. **Semester: III**

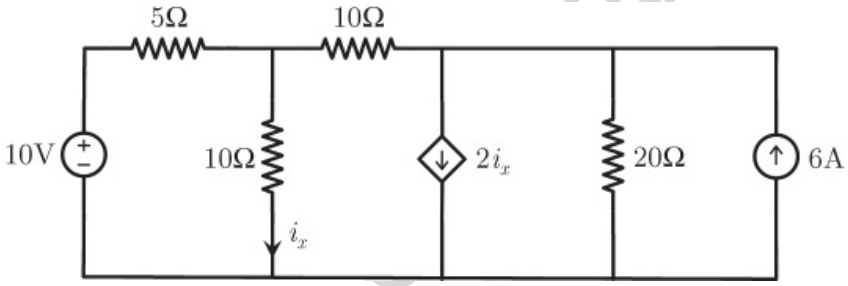
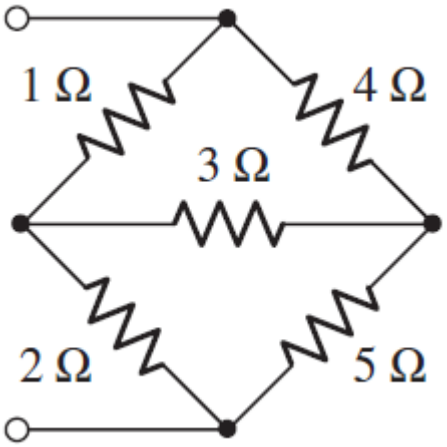
Branch: EEE/ECE/MD/ETE/EIE **Duration: 3 hrs.**

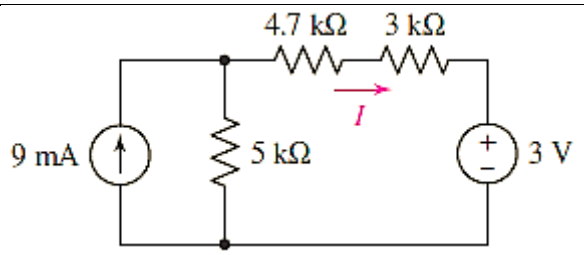
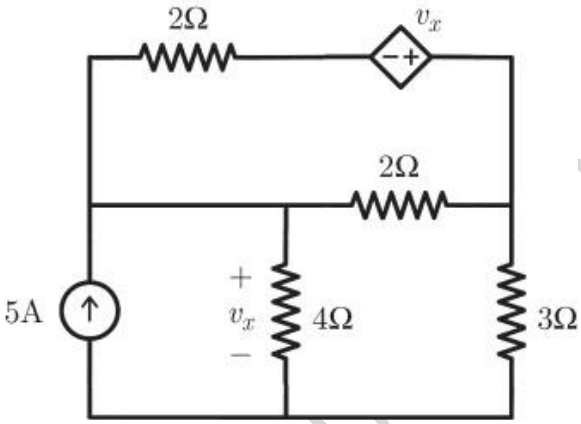
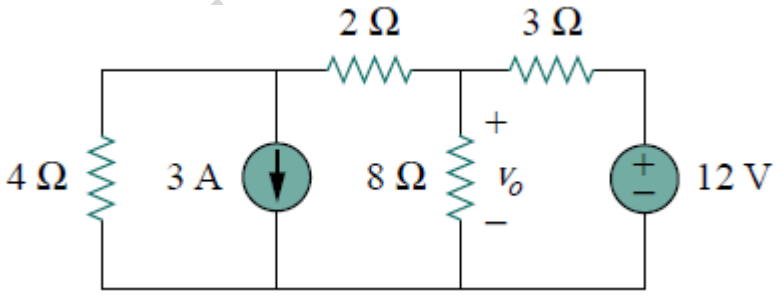
Course Code: 23ES3PCNAL **Max Marks: 100**

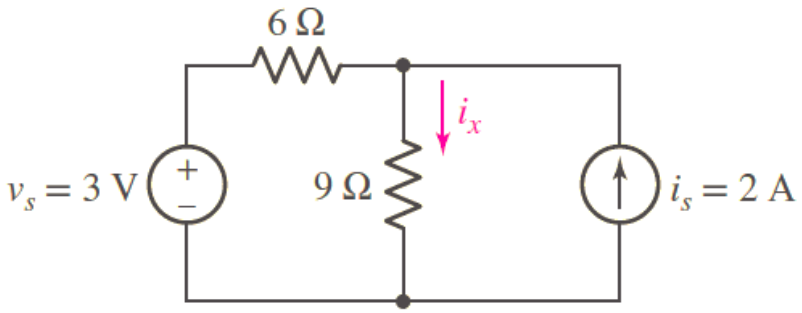
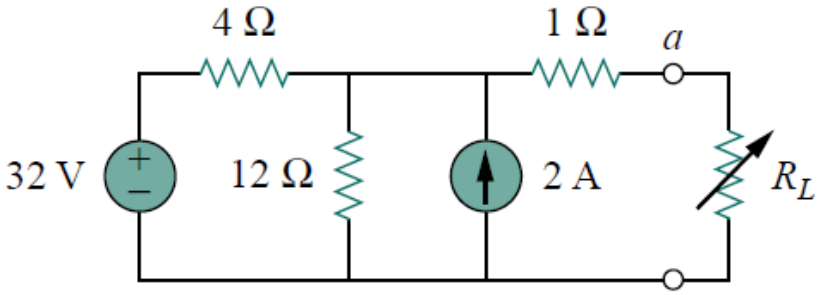
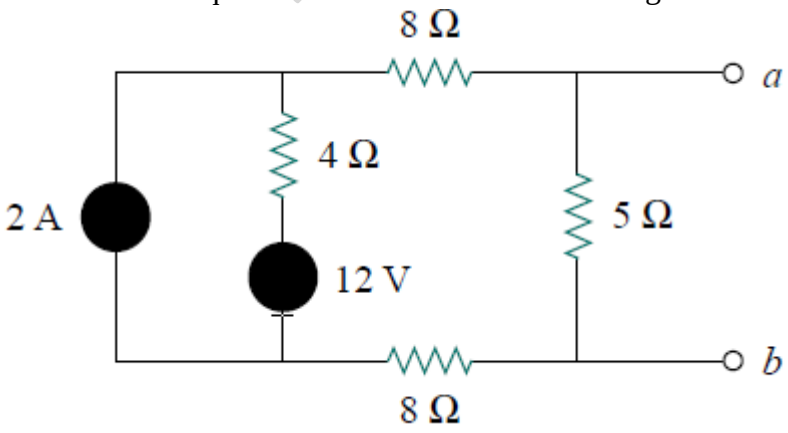
Course: Network Analysis

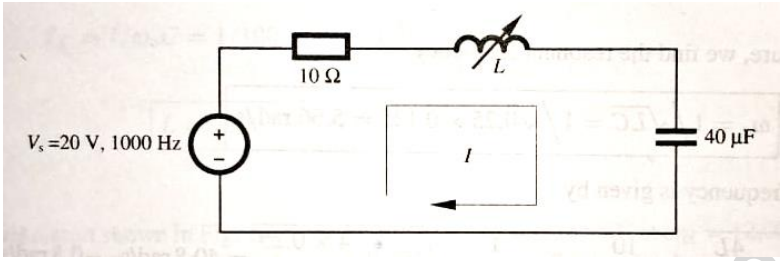
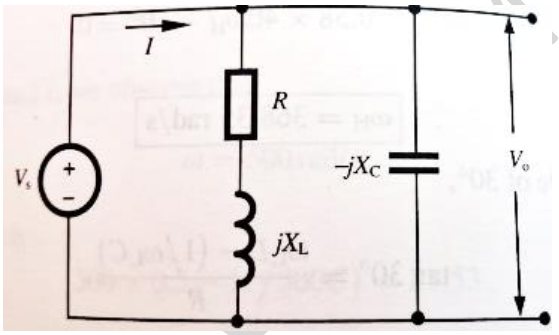
Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

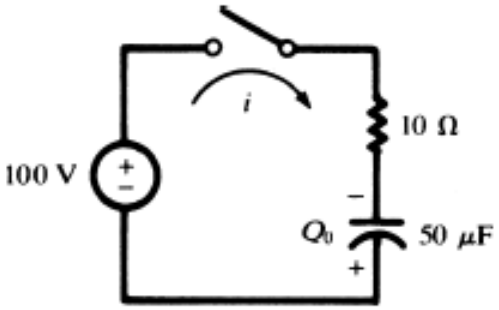
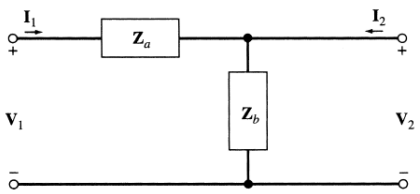
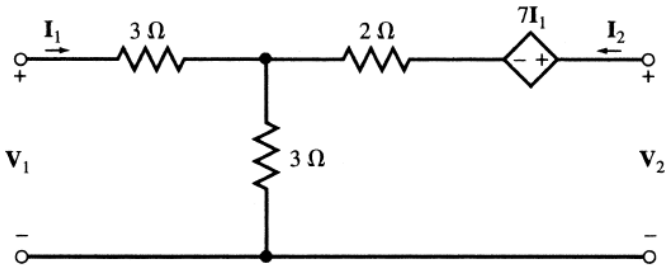
Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	CO	PO	Marks
1	a)	Using KVL technique, calculate the unknown current i_x in the circuit shown in figure 1a.  *Figure 1a.*	CO 1	PO1	8
	b)	Use the technique of Δ–Y conversion to find the Thevenin equivalent resistance of the circuit in figure 1b.  *Figure 1b.*	CO 1	PO1	7
	c)	Compute the current through the 4.7 kΩ resistor in figure 1c after first transforming the 9mA source into an equivalent voltage source.	CO 1	PO1	5

			 *Figure 1c*			
			OR			
	2	a)	Consider the following circuit shown in figure 2a. involving a voltage-dependent voltage source. Find the power of the 3 ohm resistor.  *Figure 2a.*	***CO 1***	***PO1***	***7***
		b)	Derive the general equations for the conversion of star-delta circuits considering the resistive load.	***CO 1***	***PO1***	***8***
		c)	Use source transformation to find V_o in the circuit in figure 2c.  *Figure 2c*	***CO 1***	***PO1***	***5***
			UNIT - II			
	3	a)	For the circuit of Figure 3a, use superposition to determine the unknown branch current i_x.	***CO 1***	***PO1***	***6***

			 *Figure 3a*			
	b)	Find the Thevenin equivalent circuit of the circuit shown in Figure 3b, to the left of the terminals a-b. Then find the current through R_L for i. R_L= 6ohms and ii. R_L= 16 ohms.  *Figure 3b.*	***CO 1***	***PO1***	***8***
	c)	State and explain reciprocity theorem with the help of a circuit diagram	***CO 1***	***PO1***	***6***
		OR			
4	a)	State the Norton's theorem with an example.	***CO 1***	***PO1***	***6***
	b)	Find the Norton equivalent circuit of the circuit in figure 4b.  *Figure 4b*	***CO 1***	***PO1***	***8***
	c)	Prove that the maximum power delivered to a resistive load is given by $$p_{max} = \frac{V_{Th}^2}{4R_{Th}}$$	***CO 1***	***PO1***	***6***

			UNIT - III			
	5	a)	Consider a series RLC circuit energized through a DC source of voltage –Vs. Derive the expression for resonant frequency and maximum power delivered at resonance condition.	***CO 2***	***PO2***	***8***
		b)	Consider a series resonant circuit shown in figure 5b. Find the voltage drop across each element under resonance. Find the value of the inductance also, given the applied voltage is 20 V at 1 kHz.  *Figure 5b.*	***CO 2***	***PO2***	***6***
		c)	Derive the expression for the resonant frequency for the circuit shown in the figure 5c.  *Figure 5c.*	***CO 2***	***PO2***	***6***
			OR			
	6	a)	In a series RLC network, R=50 ohm, C=20uF and L=50 mH. Find the voltage across each element when the voltage across the resistor is a maximum, given the applied voltage is 100 V with a variable frequency.	***CO 2***	***PO2***	***7***
		b)	Derive the relation between quality factor and resonant frequency of a parallel resonant RLC circuit.	***CO 2***	***PO2***	***7***
		c)	For a series resonance circuit, derive the expression for the natural frequncy ω when voltage across the inductor is maximum.	***CO 2***	***PO2***	***6***
			UNIT - IV			
	7	a)	State and prove the initial value theorem applied using Laplace transform.	***CO 2***	***PO2***	***8***
		b)	Find the current developed in a series RLC circuit in response to the following two voltage sources applied to it at t = 0: (a) a unit-step, (b) a unit-impulse.	***CO 2***	***PO2***	***8***

		c)	Find the Laplace transform of $f(t) = 1 - e^{-at}$, where a is a constant.	***CO 2***	***PO2***	***4***
			OR			
	8	a)	In the series RC circuit of Figure 8a, the capacitor has an initial charge of 2.5 mC. At $t = 0$, the switch is closed and a constant-voltage source $V = 100$ V is applied. Use the Laplace transform method to find the current.  Figure 8a	***CO 2***	***PO2***	***8***
		b)	State and prove the Final value theorem applied using Laplace transform.	***CO 2***	***PO2***	***8***
		c)	Find the Laplace transform of $e^{-at}\cos\omega t$, where a is a constant.	***CO 2***	***PO2***	***4***
			UNIT - V			
	9	a)	The **Z**-parameters of a two-port network N are given by $\mathbf{Z}_{11} = 2s + 1/s \quad \mathbf{Z}_{12} = \mathbf{Z}_{21} = 2s \quad \mathbf{Z}_{22} = 2s + 4$ Find the T-equivalent for the given Z parameter data	***CO3***	***PO5***	***10***
		b)	Derive the Conversion expressions between Z- and Y-Parameters	***CO3***	***PO5***	***10***
			OR			
	10	a)	Find the T-parameters as shown in Fig. 10a where **Z***a* and **Z***b* are nonzero.  *Figure 10a*	***CO3***	***PO5***	***10***
		b)	Find the **Z**- and **Y**-parameters of Fig 10b  *Figure 2*	***CO3***	***PO5***	***10***

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