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**BTECH**  
**(SEM IV) THEORY EXAMINATION 2024-25**  
**NETWORKS ANALYSIS & SYNTHESIS**

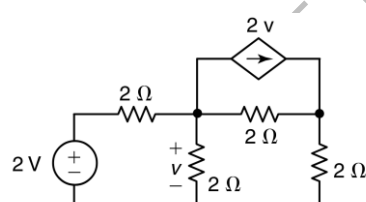
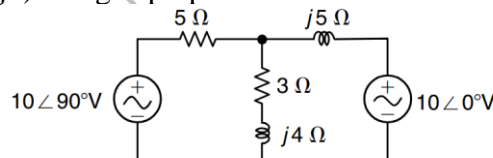
**TIME: 3 HRS****M.MARKS: 100**

**Note:** Attempt all Sections. In case of any missing data; choose suitably.

**SECTION A****1. Attempt all questions in brief.****2 x 10 = 20**

Q No.	Question	CO	Level
a.	Define the following terms: (i) Graph of a network (ii) Oriented graph	1	K2
b.	Enlist the properties of a tree.	1	K1
c.	Write limitations of the superposition theorem.	2	K2
d.	Explain the application and limitations of Millman's theorem.	2	K2
e.	Differentiate between transient response and steady-state response in a linear time-invariant system.	3	K2
f.	For an RC circuit with a step input, what is the natural response of the capacitor voltage?	3	K2
g.	Define poles and zeros in the context of network functions. What is their significance in system behavior?	4	K2
h.	What is the difference between driving point function and transfer function in a one-port network?	4	K2
i.	Differentiate between passive and active filters with suitable examples.	5	K2
j.	Define a positive real (PR) function. List any two properties of a PR function	5	K2

**SECTION B****2. Attempt any three of the following:****10 x 3 = 30**

Q No.	Question	CO	Level
a.	For the network shown in Fig., draw the oriented graph, select a suitable tree and obtain the fundamental cut-set matrix. Determine the node equations and find v. 	1	K3
b.	For the network shown in Fig. calculate the current throughout the impedance $(3 + j4)$ using superposition theorem 	2	K2
c.	Using classical methods, derive the complete time response of an RL circuit excited by a DC voltage source. Clearly identify the transient and steady-state components.	3	K2



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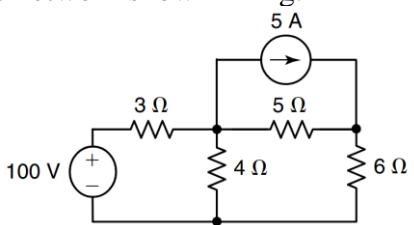
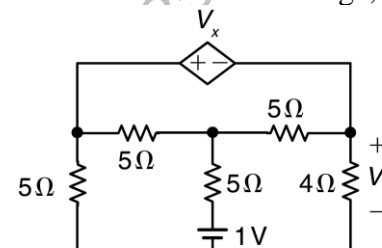
**M.MARKS: 100**

d.	Analyze the conditions for reciprocity and symmetry in a two-port network using Z-parameters. Derive the necessary expressions.	4	K4
e.	Analyze the synthesis procedure of an RC driving point impedance function using Foster's first form. Illustrate your answer with a suitable example.	5	K4

**SECTION C**

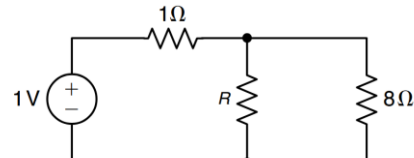
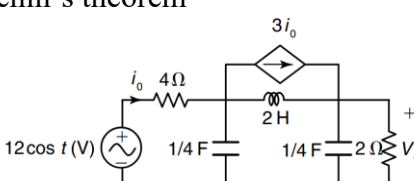
**3. Attempt any one part of the following:**

**10 x 1 = 10**

Q No.	Question	CO	Level
a.	Draw the dual of the network shown in Fig. 	1	K3
b.	the circuit of Fig. 3.42 contains a voltage-controlled voltage source. For this circuit, draw the oriented graph. By selecting a proper tree obtain the tie-set matrix and hence calculate the voltage, $V_x$ . 		K3

**4. Attempt any one part of the following:**

**10 x 1 = 10**

Q No.	Question	CO	Level
a.	In the network shown in Fig., the resistance R is changed from 4Ω to 2Ω. Verify the compensation theorem. 	1	K3
b.	Find $V_0$ using Thevenin's theorem 		K3



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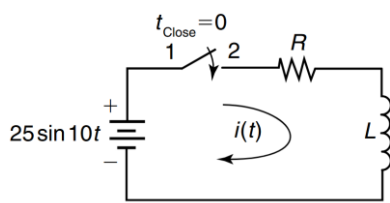
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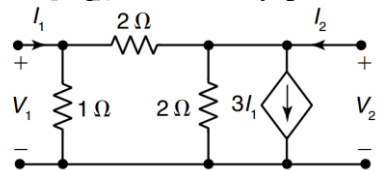
**5. Attempt any one part of the following:**

**10 x 1 = 10**

Q No.	Question	CO	Level
a.	A sinusoidal voltage $25\sin 10t$ is applied at time $t=0$ to a circuit as shown in Fig. Find the current $i(t)$ by Laplace transform method. $R=5\Omega$ and $L=1$ H 	1	K2
b.	Use Laplace transform techniques to evaluate the time response of a second-order RLC circuit driven by a unit step input. Show all steps including inverse Laplace transformation.		K4

**6. Attempt any one part of the following:**

**10 x 1 = 10**

Q No.	Question	CO	Level
a.	Compare and contrast Z, Y, and ABCD parameters for a two-port network. Discuss their physical interpretations and applications.	1	K2
b.	For the network shown in Fig., find z and y-parameters. 		K3

**7. Attempt any one part of the following:**

**10 x 1 = 10**

Q No.	Question	CO	Level
a.	Design a simple active low-pass filter using an op-amp. Explain the role of each component and derive the transfer function.	1	K4
b.	synthesize the first and second Foster forms of LC networks for the impedance function: $Z(s) = \frac{(S^2 + 1)(S^2 + 9)}{s(S^2 + 4)}$		K3