PAPER ID-310442

Roll No:

BTECH
(SEM III) THEORY EXAMINATION 2025-26
NETWORK ANALYSIS AND SYNTHESIS

TIME: 3 HRS   **M.MARKS: 70**

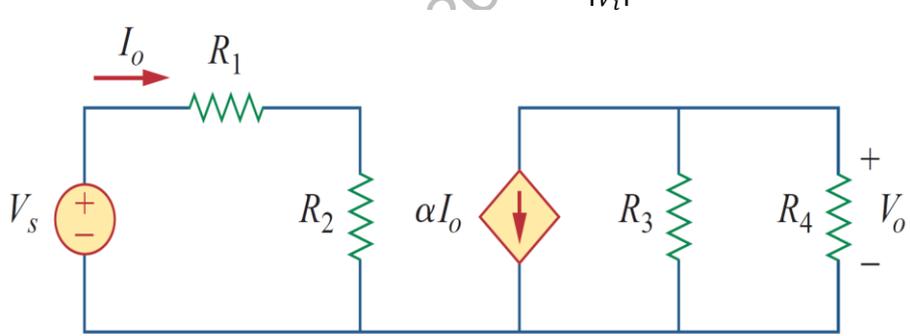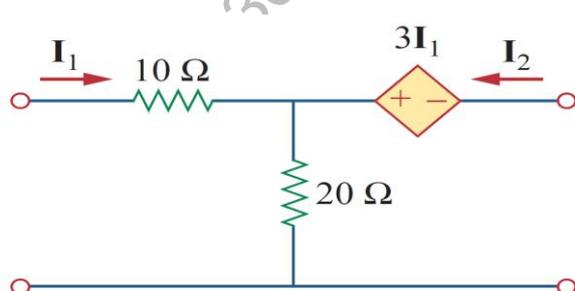**Note:** Attempt all Sections. In case of any missing data; choose suitably.

SECTION A

1.   **Attempt *all* questions in brief.**   **02 x 7 = 14**

Q no.	Question	CO	Level
a.	A current of 3.2A flows through a conductor. Calculate how much charge passes through any cross-section of the conductor in 20s.	CO1	K2
b.	Explain the physical significance of reciprocity in a two-port network.	CO4	K2
c.	Define the Laplace transform of a time-domain signal.	CO3	K2
d.	Explain steady state response and transient response.	CO3	K2
e.	Draw the equivalent circuit diagram for Thevenin's Theorem	CO2	K2
f.	Define a driving-point impedance function and explain why its poles must lie in the left half of the s-plane for physical realizability.	CO4	K2
g.	Distinguish between series resonance and parallel resonance in terms of impedance behavior at the resonant frequency.	CO5	K2

SECTION B

2.   **Attempt any *three* of the following:**   **07 x 3 = 21**

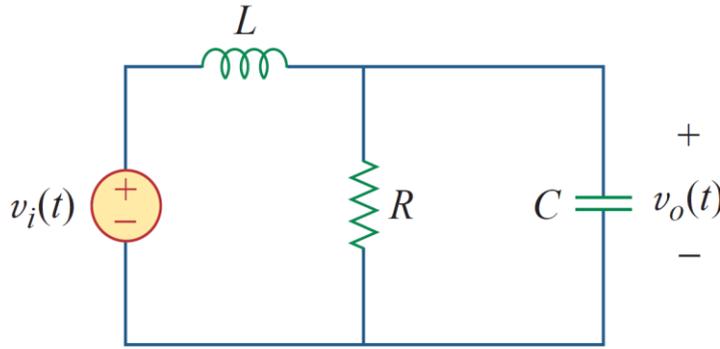|		CO	Level
a.	For the circuit in figure, find $\frac{V_o}{V_i}$ in terms of α, R_1, R_2, R_3 and R_4. If $R_1 = R_2 = R_3 = R_4$, what value of α will produce $\left|\frac{V_o}{V_i}\right| = 10$?	CO1	K3
b.	Explain the principle of superposition theorem and clearly state its limitations when applied to electrical networks.	CO2	K3
c.	State and explain any four properties of the Laplace transform. Using Laplace transform, find the transform of $$f(t) = \sin(2t) + e^{-8t}, t \geq 0.$$	CO3	K2-K3
d.	Find the transmission parameters for the two-port network in the figure.	CO4	K3
e.	Determine what type of filter is shown in the figure. Calculate the corner	CO5	K3

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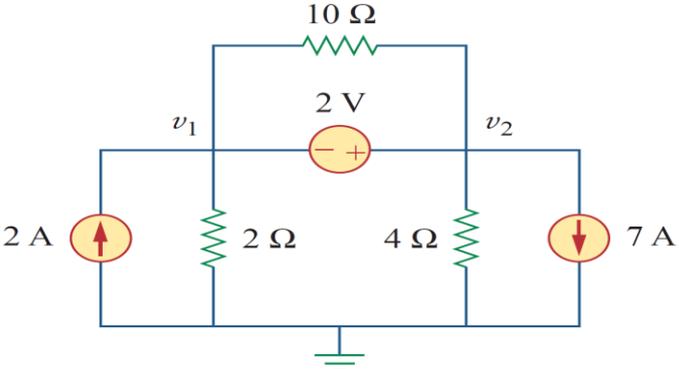**TIME: 3 HRS**   **M.MARKS: 70**
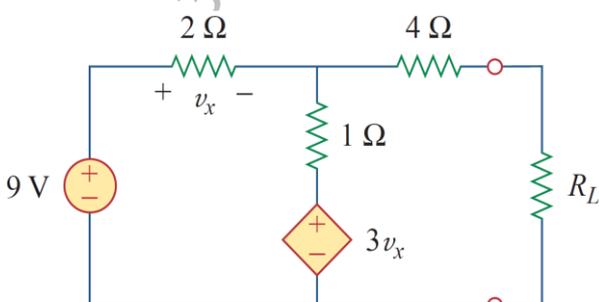
or cutoff frequency. Take $R = 2k\Omega, L = 2H$ and $C = 2\mu F$.

SECTION C

3.   Attempt any *one* part of the following: **07 x 1 = 07**

Q no.	Question	CO	Level
a.	For the circuit shown in the figure, find the node voltages.	CO1	K3
b.	Explain the principle of duality in electrical networks and list the pairs of dual quantities.	CO1	K2-K3

4.   Attempt any *one* part of the following: **07 x 1 = 07**

Q no.	Question	CO	Level
a.	Determine the value of R_L that will draw the maximum power from the rest of the circuit in figure. Calculate the maximum power.	CO2	K3

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b.	Find the Thevenin equivalent of the circuit in the figure at terminals *a-b*.	CO2	K3

5.   **Attempt any *one* part of the following:**   07 x 1 = 07

Q no.	Question	CO	Level
a.	If the switch in figure has been closed for a long time before $t = 0$, but is opened at $t = 0$, determine: (a) the characteristic equation of the circuit, (b) i_x and v_R for $t > 0$.	CO3	K3-K4
b.	Determine the average power generated by each source and the average power absorbed by each passive element in the circuit of the figure.	CO3	K3

6.   **Attempt any *one* part of the following:**   07 x 1 = 07

Q no.	Question	CO	Level
a.	Obtain the *y* parameters for network in the figure. the ∏ shown	CO4	K3

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b.	Find the *g* parameters as functions of *s* for the circuit in the figure	CO4	K3

1 H   1 F

1 Ω

7. **Attempt any *one* part of the following:** **07 x 1 = 07**
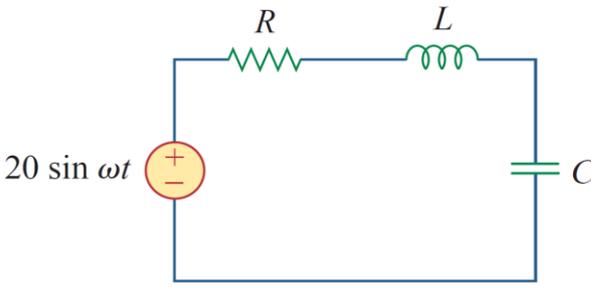
Q no.	Question	CO	Level
a.	In the circuit of figure, $R = 2\Omega, L = 1mH$ and $C = 0.4\mu F$ (a) Find the resonant frequency and the half-power frequencies. (b) Calculate the quality factor and bandwidth. (c) Determine the amplitude of the current at ω_o, ω_1, and ω_2. R L $20 \sin \omega t$ C	CO5	K3-K4
b.	Explain the following passive filters: (i) Low Pass filter (ii) High pass filter (iii) Band pass filter (iv) Band stop filter (v) All pass filter	CO5	K2