

Roll No:

BTECH
(SEM. IV) THEORY EXAMINATION 2025-26
NETWORKS ANALYSIS & 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.

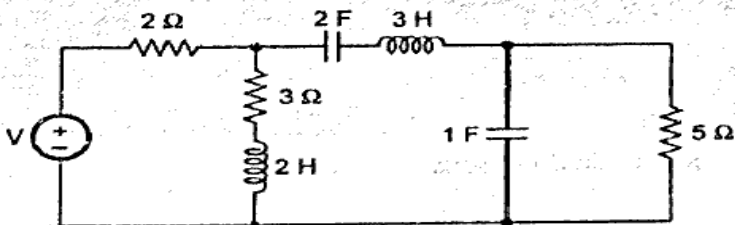
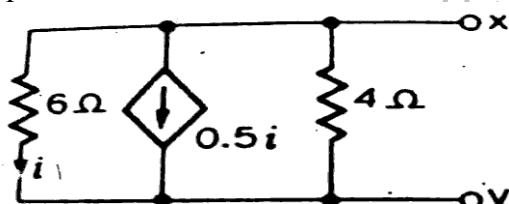
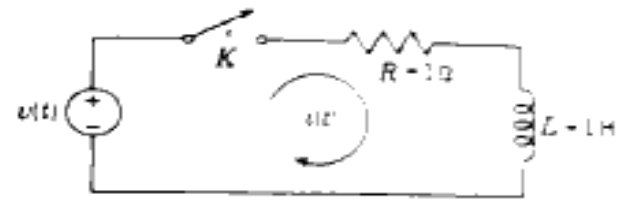
02 x 7 = 14

Q no.	Question	CO	Level
a.	What do you mean by "GRAPH" and "ORIENTED GRAPH" in circuit theory?	1	K2
b.	State and explain the Tellegen's theorem.	2	K2
c.	Calculate the time constant for first-order RC networks.	3	K2
d.	Explain the concept of poles and zeros in network functions.	4	K2
e.	Distinguish between a driving point function and a transfer function.	4	K2
f.	Distinguish between the Foster I and Foster II form.	5	K2
g.	Why are active filters preferred over passive filters in integrated circuit (IC) design?	5	K2

SECTION B

2. Attempt any three of the following:

07 x 3 = 21

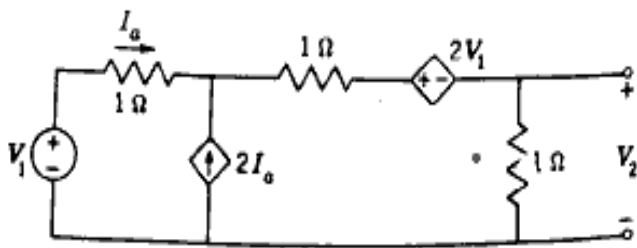
Q no.	Question	CO	Level
a.	Draw the dual of the network shown in figure 01.  Figure No. 01	1	K2
b.	Find Norton's equivalent circuit to the left of terminal x-y in figure 02  Figure No. 02	2	K3
c.	In the network shown in the figure 03, $v(t) = 0$ for $t < 0$, and $v(t) = t$ for $t \geq 0$. Show that $i(t) = t - 1 + e^{-t}$ for $t \geq 0$.  Figure No. 03	3	K3

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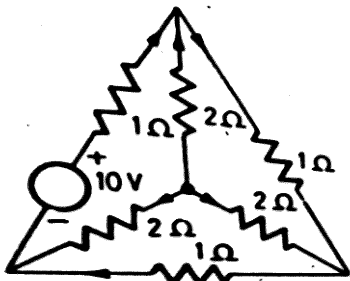
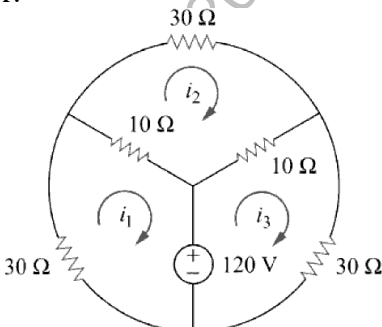
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d.	The given network shown in figure 04 contains resistors and controlled sources. For this network, compute $G_{12} = V_2/V_1$.  Figure No. 04	4	K3
e.	What do you mean by "ACTIVE" and "PASSIVE" filters? What are the advantages and disadvantages of active filters over passive filters? Discuss the different types of active and passive filters.	5	K2

SECTION C

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

07 x 1 = 07

Q no.	Question	CO	Level
a.	In the given network shown in figure 05, determine the branch current & branch voltage using cut-set matrix?  Figure No. 05	1	K2
b.	In the given network shown in figure 06, determine the i_1, i_2 and i_3 using tie-set matrix?  Figure No. 06	1	K2

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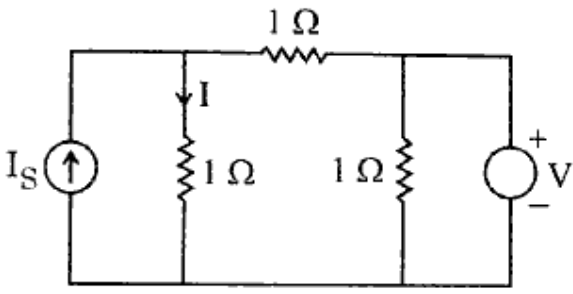
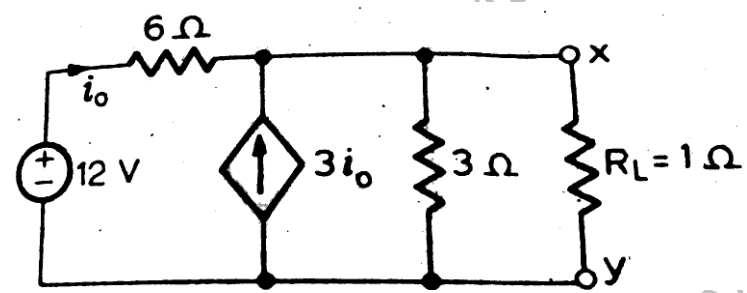
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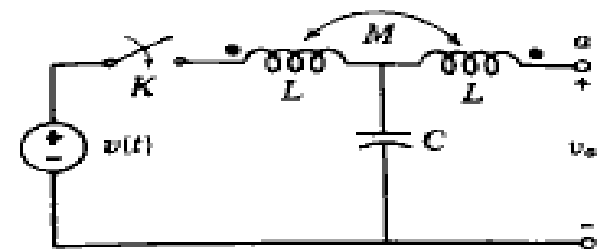
4. Attempt any one part of the following:

07 x 1 = 07

Q no.	Question	CO	Level
a.	In the circuit shown figure 07, $I = 1\text{Amp}$ for $I_s = 0\text{Amp}$. Determine the value of I for $I_s = 2\text{Amp}$.  Figure No. 07	2	K3
b.	Find the current through R_L in the circuit of figure 08 using Thevenin's theorem.  Figure No. 08	2	K3

5. Attempt any one part of the following:

07 x 1 = 07

Q no.	Question	CO	Level
a.	In the network shown in the figure 09, consists of two coupled coil and a capacitor. At $t = 0$, the switch K closed connecting a generator of voltage, $v(t) = V \sin(t/\sqrt{MC})$. Show that $v_a(0^+) = 0$, $\frac{dv_a}{dt}(0^+) = (V/L)\sqrt{M/C}$, and $\frac{d^2v_a}{dt^2}(0^+) = 0$  Figure No. 09	3	K4
b.	The circuit shown in figure 10 consists of a resistor and a relay with inductance L. The relay is adjusted so that it is actuated when the current through the coil is 0.008Amp. The switch K is closed at $t = 0$,	3	K4

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and it is observed that the relay is actuated when $t = 0.1 \text{ sec}$. Find: (a) the inductance L of the coil, (b) current $i(t)$ for $t \geq 0$.

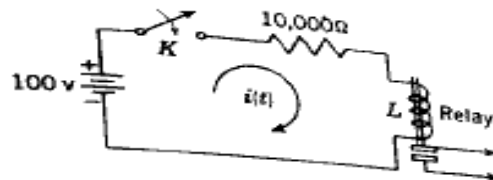
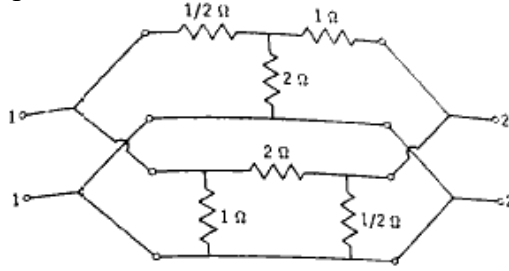
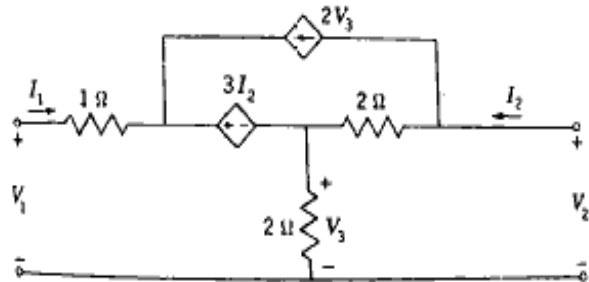


Figure No. 10

6. Attempt any one part of the following:

07 x 1 = 07

Q no.	Question	CO	Level
a.	The network shown in the figure 11 consists of a resistive T and a resistive π network connected in parallel. For the element values given, determine the y parameters.  Figure No. 11	4	K3
b.	Determine g and h - parameter in the given network shown in figure 12.  Figure No. 12	4	K3

s7. Attempt any one part of the following:

07 x 1 = 07

Q no.	Question	CO	Level
a.	Obtain both Cauer I and II realizations of the driving point function given by: $Z(s) = \frac{10s^4 + 12s^2 + 1}{2s^3 + 2s}$	5	K2
b.	Explain the properties of positive real function. LC function and RL functions.	5	K2