CLASS: B-TECH   SEMESTER : III/ADD
BRANCH: ECE   SESSION : MO/2024

SUBJECT: EC209 NETWORK THEORY

TIME: 02 Hours   **FULL MARKS: 25**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates
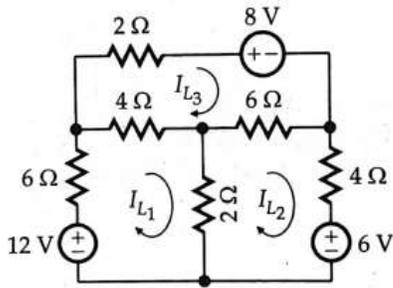

			CO	BL

Q.1(a)   A reduced incidence matrix of a graph is given by   [2]   CO-1   BL-1

$$a=\begin{bmatrix} 1 & 1 & 0 & 0 & 0 & 1 \\ 0 & -1 & 1 & -1 & 0 & 0 \\ -1 & 0 & -1 & 0 & -1 & 0 \end{bmatrix}.$$

Find out the number of possible trees.

Q.1(b)   A network is shown in the given figure. Write down the tie-set matrix by   [3]   CO-1   BL-3
considering a suitable tree.

Q.2(a)   (i) Write the relation among reduced incidence matrix [A], branch   [2]   CO-1   BL-3
admittance matrix $[Y_b]$, current source matrix $[I_s]$ and voltage source
matrix $[V_s]$ and node voltage $[V_n]$.

(ii) Write the relation among fundamental cut set matrix [Q], branch
admittance matrix $[Y_b]$, twig voltage matrix $[V_T]$, current source
matrix $[I_s]$ and voltage source matrix $[V_s]$.

Q.2(b)   For the given network in the Figure, draw a graph and select a tree with branches   [3]   CO-1   BL-3
having resistance 3 of ohm (branch-2) and 4 ohm (branch-4, having registance 4
and voltage source 24 in series). Determine the Tie-set matrix. Using topological
form of KVL equation, find various branch currents. The branch numbers are
marked with integers and node numbers are encircled.
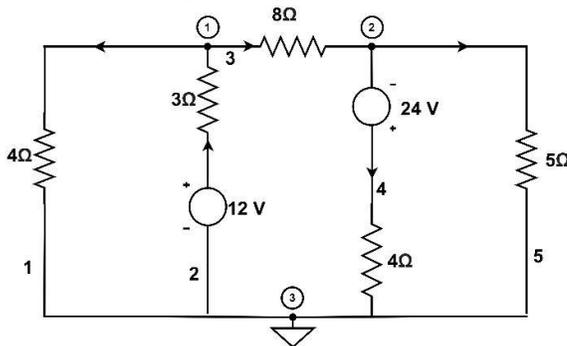
Q.3(a)   Define Tellegen's and substitution theorem.   [2]   CO-1   BL-1,2
Q.3(b)   For the network shown in the Figure, write down the f-cut set matrix for the tree   [3]   CO-1   BL-3,4
         having 3 H inductor and 2 F capacitor as twigs, and write the network equilibrium
         equation using Cut-set.
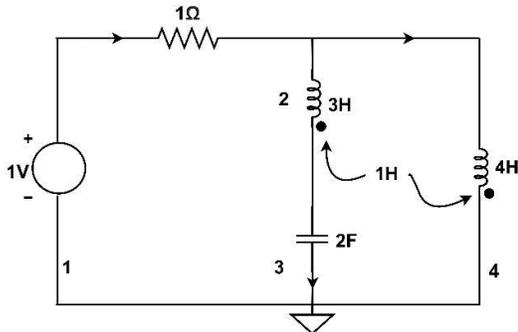
Q.4(a)   Verify the Tellegen's theorem for the network shown in the figure.   [2]   CO-2   BL-1,2
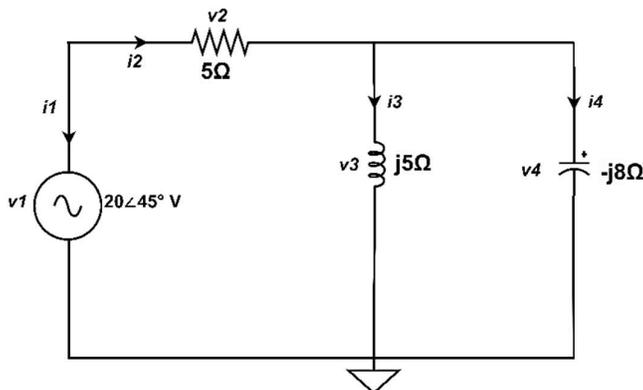
Q.4(b)   Verify reciprocity theorem for the network shown in the figure in which voltage   [3]   CO-2   BL-1,2
         source of 5 volt cause a current 'I' in the 2 ohm resistor. Find the value of 'I'.
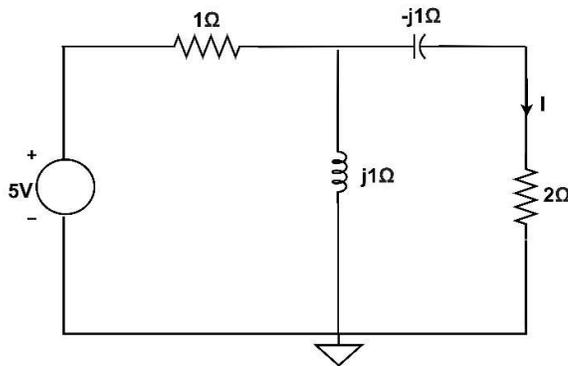
Q.5(a)   Define state and state variable. Form the state equations for the RLC series   [2]   CO-2   BL-1,2
         circuit.
Q.5(b)   In the network shown in the figure, verify the substitution theorem by replacing [3]   CO-2   BL-3
         the 6 ohm resistor by a voltage source.