BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION MO/2023)

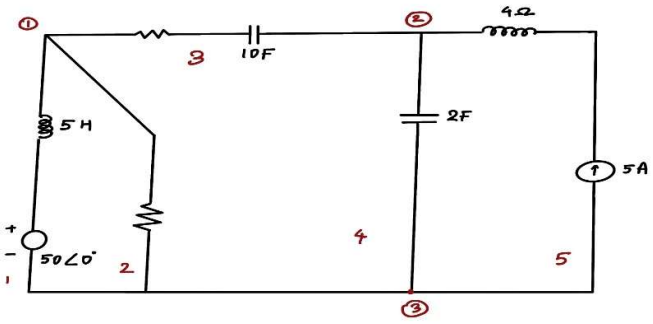
CLASS: B-TECH **SEMESTER : III**
BRANCH: EEE **SESSION : MO/2023**

SUBJECT: EE205 CIRCUIT THEORY

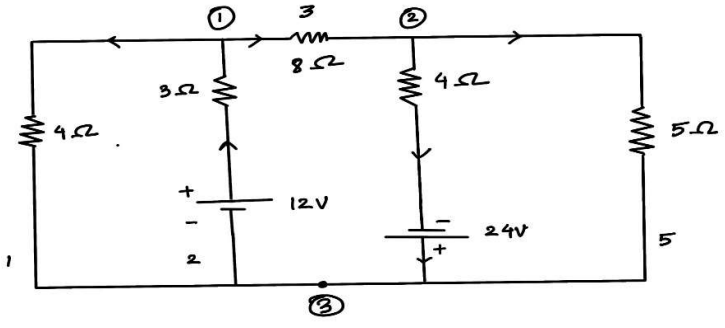
TIME: 02 Hours **FULL MARKS: 25**

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)	Define an oriented graph. Write the relation between number of twigs, links and nodes.	[2]	CO-1	BL-1
Q.1(b)	Develop the graph of the network shown in Figure. The resistance in branch- 3 is 2 ohm. Obtain the Tie-set matrix by selecting a tree with twigs labeled 2 and 3.	[3]	CO-1	BL-3



Q.2(a)	A reduced incidence matrix of a graph is given by $a=\begin{bmatrix} 1 & 1 & 0 & 0 & 0 & 1 \\ 0 & -1 & 1 & -1 & 0 & 0 \\ -1 & 0 & -1 & 0 & -1 & 0 \end{bmatrix}$. Find out the number of possible trees.	[2]	CO-1	BL-3
Q.2(b)	For the given network in the Figure, draw a graph and select a tree with branches having registance 3 ohm (branch-2) and 4 ohm (branch-4, having registance 4 and voltage source 24 in series). Determine the Cut-set matrix. Using topologilcal form of KCL equation, find various branch voltages and currents. The branch numbers are marked with integers and node numbers are encircled.	[3]	CO-1	BL-3



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

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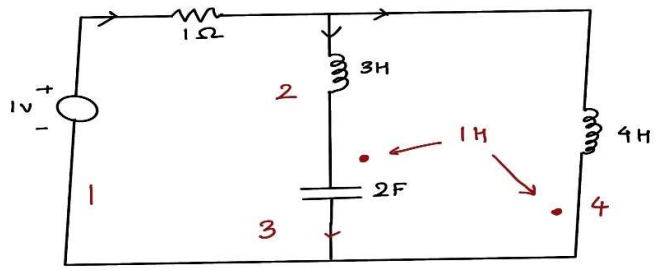
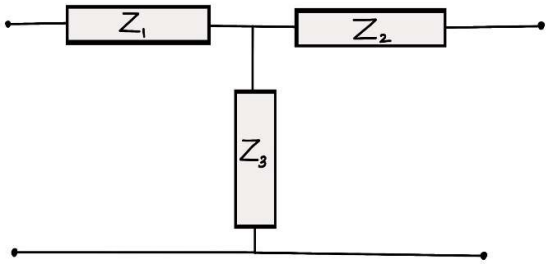
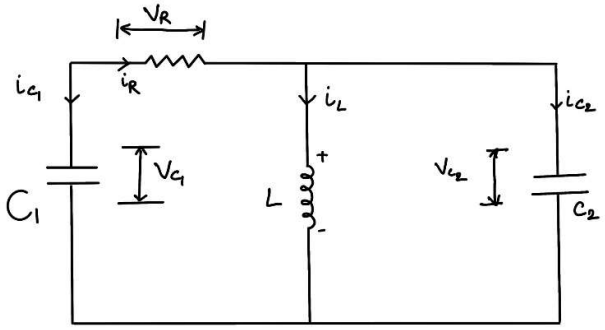
Q.3(b)	For the network shown in the Figure, write down the f-cut set matrix for the tree having 3 H inductor and 2 F capacitor as twigs, and write the network equilibrium equation using Cut-set.	[3]	CO-1	BL-3,4



Q.4(a)	Define Tellegen's and substitution theorem.	[2]	CO-2	BL-1,2
Q.4(b)	Verify reciprocity theorem for the T-network shown below.	[3]	CO-2	BL-1,2



Q.5(a)	Define state and state vector. Write two advantages of state variable analysis.	[2]	CO-2	BL-1,2
Q.5(b)	From the state matrix equation for the network as shown in the figure.	[3]	CO-2	BL-3



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