BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BTECH **SEMESTER : III/ADD**
BRANCH: EEE **SESSION : MO/2025**

SUBJECT: EE24209 CIRCUIT THEORY

TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data handbook/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	Analyze the graph of the network as in Fig. 1 and evaluate the possible tress.	[2]	CO1, CO2 & CO4	BL3 BL4

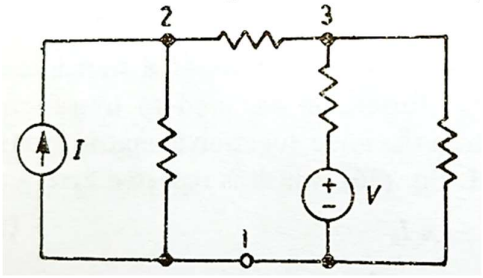

Fig.

Q.1(b)	Select a suitable tree based on the obtained graph for Fig. 2 and determine the tie-set matrix. Analyze the KVL equation from the tie-set matrix.	[3]	CO1, CO2 & CO4	BL3 BL4

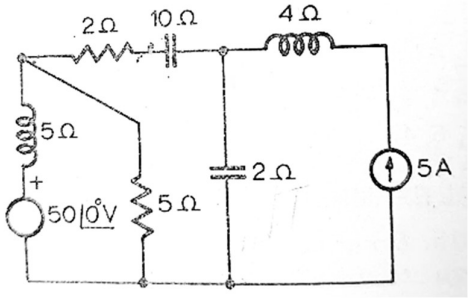

Fig. 2

Q.1(c)	Analyze the graph for Fig. 3 as shown below. Select a suitable tree and obtain the (i) cut-set matrix and (ii) tie-set matrix.	[5]	CO1, CO2 & CO4	BL3 BL4

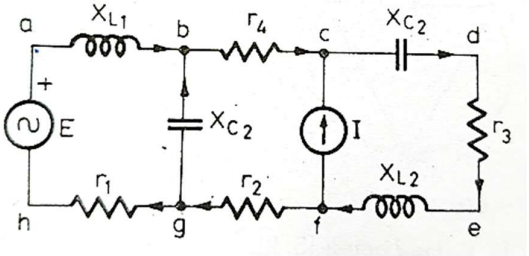

Fig. 3

PTO

Q.2(a)	Validate the Tellegen's Theorem for the network as in Fig. 4 with V_1 = 10 V, V_2 = 4V, V_4 = 6V, I_1 = I_2 = 2A, I_3 = 4A.	[5]	CO2 & CO4	BL1 BL4

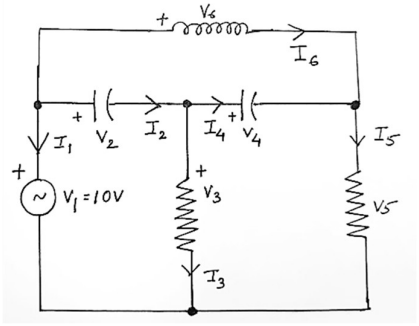

Fig. 4

Q.2(b)	Evaluate the voltage V_x In the network shown in Fig. 5 and verify the reciprocity theorem.	[5]	CO2 & CO4	BL1 BL4

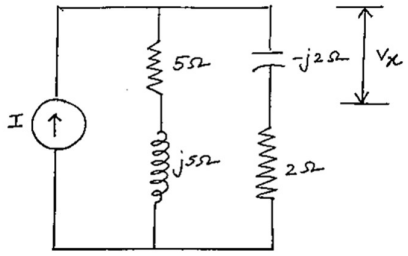

Fig. 5

Q.3(a)	Analyze the driving point admittance function and the respective pole-zero plot for the circuit as in Fig. 6.	[5]	CO1 & CO3	BL1 BL4

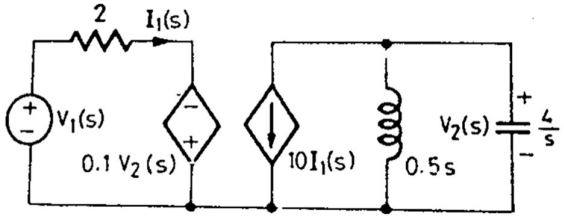

Fig. 6

Q.3(b)	The Z parameters of a circuit are given by $\begin{bmatrix} 4 & 1 \\ 3 & 3 \end{bmatrix}$, evaluate (i) transmission parameters and (ii) h-parameters.	[5]	CO1, CO2 & CO4	BL1 BL4
Q.4(a)	Test the positive realness of the function. $$z(s) = \frac{s^3 + 5s^2 + 9s + 3}{s^3 + 4s^2 + 7s + 9}$$	[5]	CO1, CO2 & CO4	BL1 BL4
Q.4(b)	Realize the following impedance function in both Cauer Form-I & Cauer Form-II and synthesize the corresponding networks. $$z(s) = \frac{12s^4 + 10s^2 + 1}{3s^3 + 2s}$$	[5]	CO1, CO2 & CO4	BL1 BL4
Q.5(a)	Considering RC series circuit with input voltage (V_i), analyze the type of filter when output voltage (V_o) is considered across (i) capacitor, (ii) resistor.	[5]	CO5	BL1 BL4
Q.5(b)	Analyze the second order low pass filter using Butterworth Approximation.	[5]	CO5	BL1 BL4

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