

JK Lakshmi Pat University Jaipur
INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination, Dec. 2023
 B. Tech. All branches, Semester-V

Roll No.....

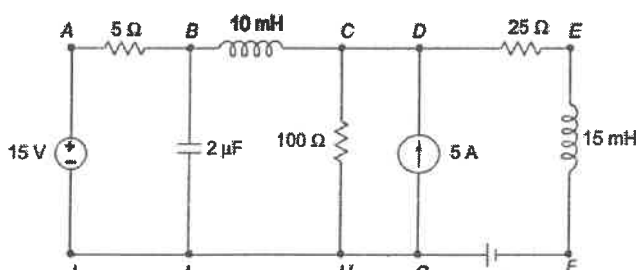
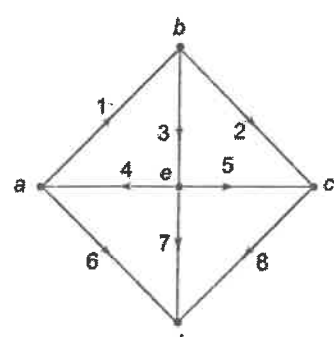
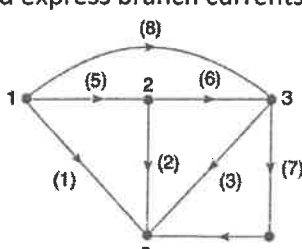
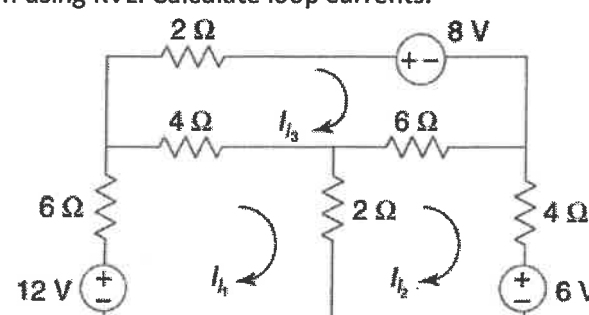
EE1406: Graph Theory and Filter Circuits

Time: 2 hrs 30 Min

Max. Marks: 40

Instructions to students:

1. Do not write anything other than your roll number on the question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Attempt all questions.

Q-1	For the electrical network shown in Fig. draw its topological graph and write its incidence matrix, tie-set matrix. 	05 Marks (CO-1)
Q-2	For the network-graph shown in Fig. with given orientation obtain the fundamental cut-set matrix. 	05 Marks (CO-1)
Q-3	Write the incidence matrix of the graph of Fig. and express branch voltages in terms of node voltages. Write the tieset matrix and express branch currents in terms of loop currents. 	05 Marks (CO-1)
Q-4	For the network shown in Fig., write down the tieset matrix and obtain the network equilibrium equation in matrix form using KVL. Calculate loop currents. 	06 Marks (CO-1)

Q-5	Design a band-pass constant-k filter with $f_1 = 2 \text{ kHz}$ and $f_2 = 3 \text{ kHz}$ and $k = 500 \Omega$.	06 Marks (CO-2)
Q-6	Design a T-section constant-k high-pass filter having a cut-off frequency of 10 kHz and a design impedance of 600Ω . Find its characteristic impedance and phase constant at 25 kHz .	06 Marks (CO-2)
Q-7 Case Study	You are a computer science engineer tasked with improving the data transmission reliability within a university data center. The current infrastructure experiences signal degradation and electromagnetic interference, leading to potential data corruption and transmission errors. Your objective is to design and implement constant K type passive filters to enhance the overall efficiency and reliability of the university's data center. Case Study Scenario: The university's data center is the hub for storing and processing vast amounts of critical information. However, the current infrastructure is susceptible to signal degradation and electromagnetic interference, which can compromise the integrity of stored and transmitted data. Your task is to design constant K type passive filters to address these issues and ensure the robustness of data transmission within the university's data center. Tasks: - Understanding the Requirements: - Identify the key requirements of the university's data center that necessitate the use of constant K type passive filters. - Designing the Filters: - Specify the parameters and characteristics of the constant K type passive filters required for the data center. - Provide a step-by-step explanation of the design process, including the calculations for determining resistor and capacitor values. - Discuss how the designed filters will mitigate signal degradation and electromagnetic interference, improving data transmission reliability.	07 Marks (CO-2)