Total number of printed pages: 4

UG/3rd Semester/UIE301

2023

NETWORK THEORY

Full Marks: 100

Time: Three hours

The figures in the margin indicate full marks for the questions.

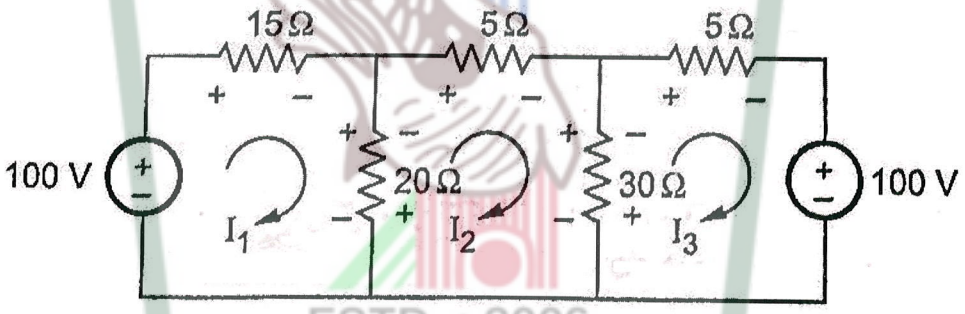
*Answer **any five** questions.*

1. a) Define the following: 4

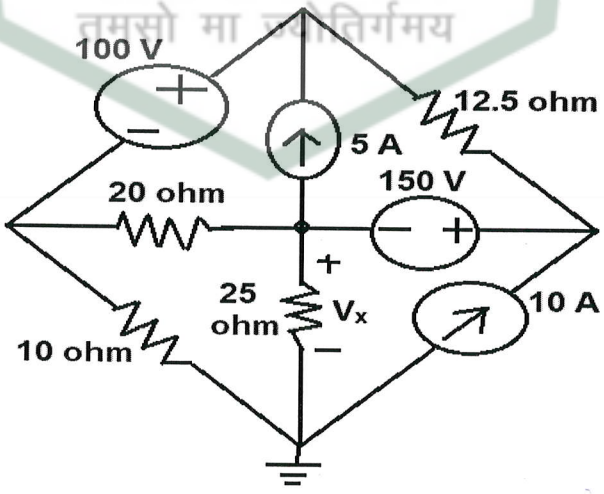
(i) Active element (ii) Bilateral element (iii) Lumped network

(iv) Continuous system

b) For the circuit shown in the figure below find the current through 30Ω resistance using mesh analysis. 6



c) Find V_x using nodal analysis for the network shown below. 10



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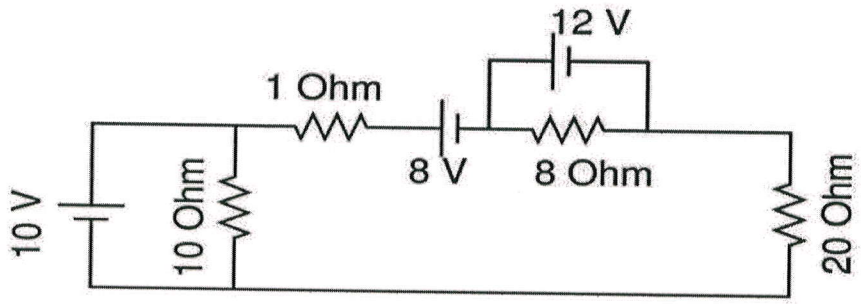
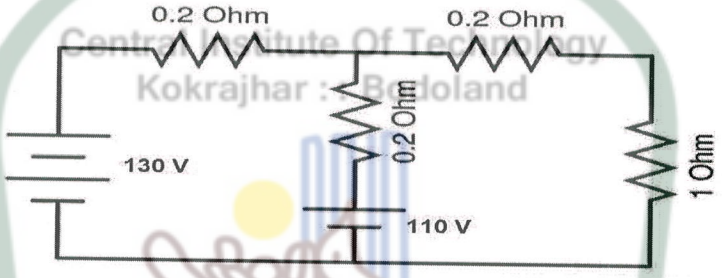
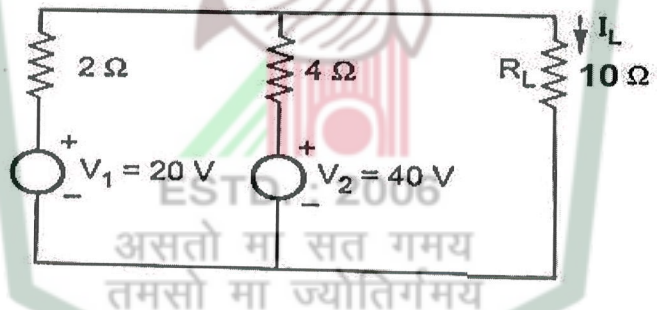
2. a) Find the current through 20 Ω resistor using Superposition principle in the circuit shown below. 10



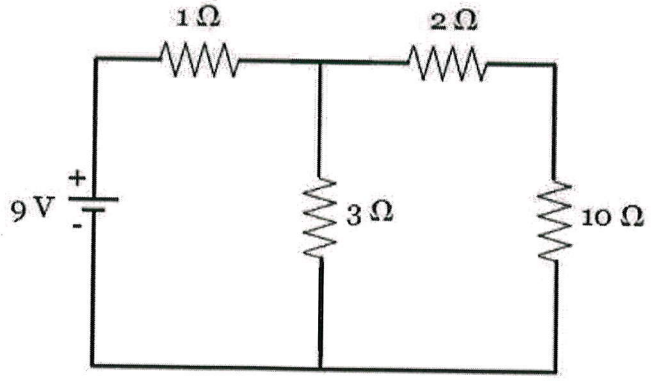
b) Find current flowing through 1 Ω resistor by Thevenin's theorem in the circuit shown below. 7



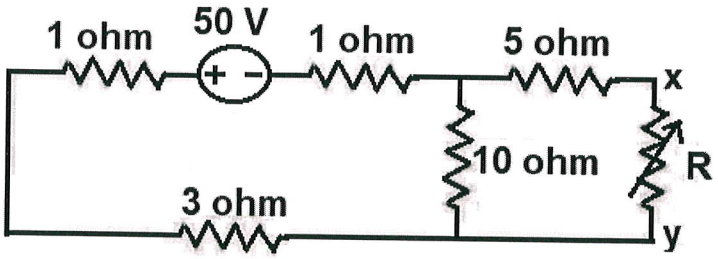
c) Using Millman's theorem find I_L through R_L for the network shown below. 3



3. a) For the given circuit, determine the current flowing through 10 Ω resistor using Norton's theorem. 8



b) Find maximum power delivered to the load R in the given circuit. 8



c) State and explain reciprocity theorem. 4

4. a) Define following terms: 3

(i) Resonance (ii) Bandwidth (iii) Half power frequency

b) Show that resonant frequency of series resonance circuit is equal to the geometric mean of two half power frequencies. 8

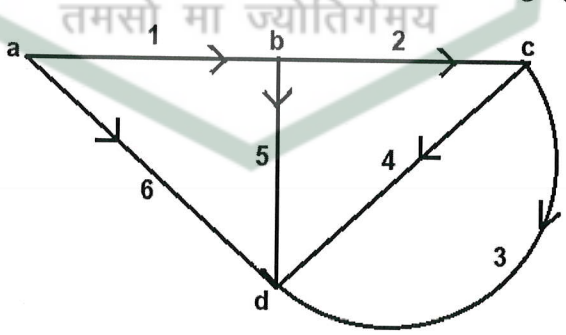
c) A series RLC circuit consist of a resistance of 1 kΩ and an inductance of 100 mH in series with capacitance of 10 pF. If 100 V is applied as input across the combination determine (i) Resonant frequency (ii) Maximum current in the circuit (iii) Q-factor of the circuit (iv) Half power frequencies. 6

d) Draw the resonance curve of the series RLC circuit. 3

5. a) Define the following terms: 4

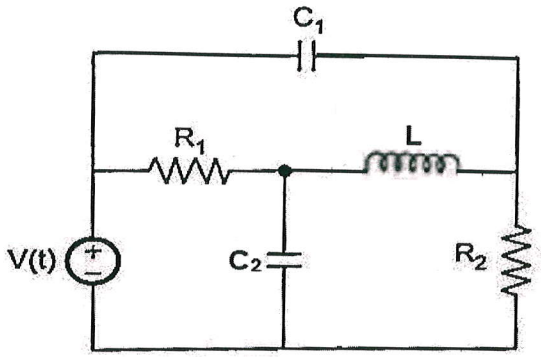
(i) Oriented graph (ii) Non-planner graph (iii) Twig (iv) Subgraph

b) For the graph shown below write tie set matrix with twigs (4, 5, 6). 5



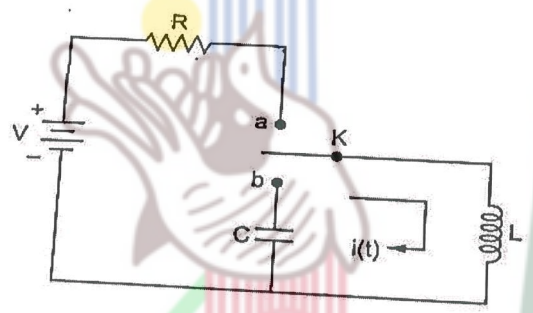
c) What are the properties of a tree in graph theory? 5

d) Construct dual network of the circuit shown below. 6



6 a) Define initial and final value theorems. 4

b) In the network shown below the switch K is moved from position 'a' to 'b' at t=0 (a steady state existing in position 'a' before t=0). Solve for the current i(t), using Laplace Transformation. 6



c) Find the transient response of a driven series R-L circuit. 10

7 a) Define T parameters. 2

b) Express Y parameters in terms of Z parameters. 7

c) A two port network has the following Z-Parameters: Z_{11}=10 Ω, Z_{22}=12 Ω, Z_{12}=Z_{21}=5 Ω. Compute the Y-parameters for the same network. 5

d) Establish a relationship between line and phase voltages and currents in a star connection. 6

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