*Total number of printed pages: 2* **D/3rd Semester/DECE305**

**2023**

# ELECTRIC CIRCUITS AND NETWORK

*Full Marks : 100*

Time : Three hours

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

*Answer **any five** questions.*

1. a) What is the difference between loop and mesh? Find $i_1$ and $i_2$ of the following circuit (Figure-1). 3+5=8

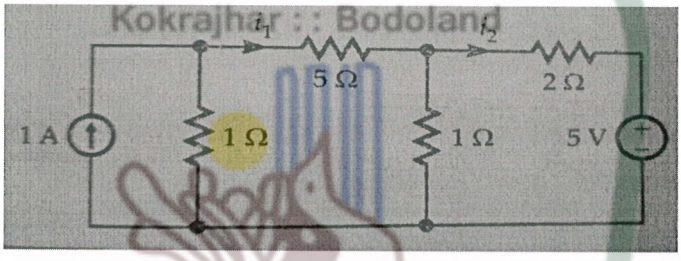


Figure-1

b) State and prove the maximum power transfer theorem. Find the current in the 5Ω resistor for the circuit shown in Figure-2 6+6=12

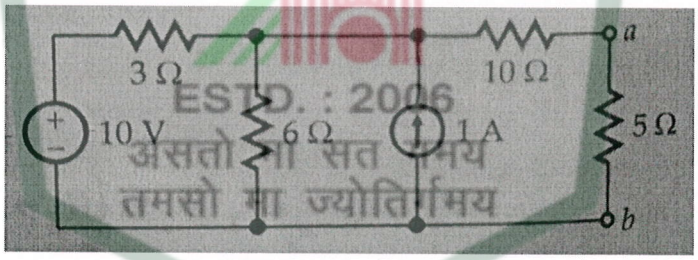


Figure-2

2 a) Explain the procedure to obtain Thevenin's and Norton's equivalent circuits. 5

b) Define the terms: (i) Graph (ii) Tree (iii) Incidence matrix (iv) Cut-set matrix (v) Tie-set matrix 3×5=15

3) a) Write properties of the tree of a graph. Draw a graph of resistive network shown in Figure-3. Select a suitable tree and obtain the tie-set matrix. 4+6=10

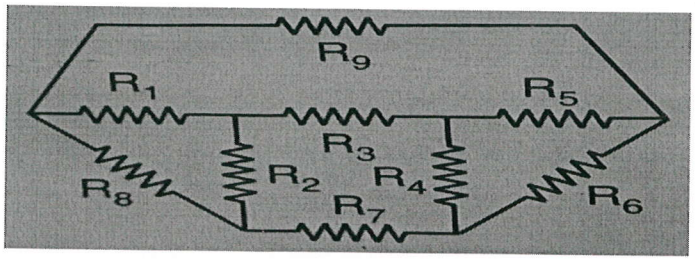


Figure-3

b) The incidence matrix of a network is given by 3+7=10

| Nodes | Branches | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| A | -1 | +1 | +1 | 0 | 0 | 0 |
| B | 0 | -1 | 0 | -1 | +1 | 0 |
| C | 0 | 0 | -1 | +1 | 0 | +1 |
| D | +1 | 0 | 0 | 0 | -1 | -1 |



Draw the oriented graph. Select a tree and find f-cut set matrix.

4 a) Find the transient responses of (i) series R-L and (ii) series R-C circuit having DC excitation. 5+5=10

b) What is steady state response and transient response? Define (i) Laplace transform and (ii) Fourier transform of a continuous-time function. 4+2+4=10

5 a) What is two-port network? Derive the condition (or result) for parallel interconnection of two 2-port networks. 3+7=10

b) Find the Z and ABCD parameters of the following circuit (Figure-4). 5+5=10



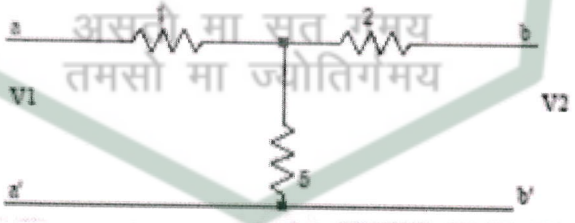


Figure-4

6 a) Draw the equivalent circuit of a 2-port network in terms of (i) Z-parameters and (ii) h-parameters. 5+5=10

b) Write the condition for reciprocity in terms of Z-parameters and T-parameters. Show that the overall transmission parameters matrix for cascaded Two 2-port networks is simply the matrix products of transmission parameters for each individual 2-port network in cascade. 4+6=10

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