Register No.: ..... Name: .....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FOURTH SEMESTER B.TECH DEGREE EXAMINATION (R), MAY 2023

(2020 SCHEME)

Course Code : 20EET296

Course Name: Network Analysis and Synthesis

Max. Marks : 100 **Duration: 3 Hours**

PART A

(Answer all questions. Each question carries 3 marks)

1. Define tree, co-tree, twig and link with suitable examples.
2. Draw the oriented graph from the complete incidence matrix given below.

Nodes ↓	Branches → 1	2	3	4	5	6	7	8
1	1	0	0	0	1	0	0	1
2	0	1	0	0	−1	1	0	0
3	0	0	1	0	0	−1	1	−1
4	0	0	0	1	0	0	−1	0
5	−1	−1	−1	−1	0	0	0	0

3. State the orthogonal relationship between f- circuit matrix B and f-cut set matrix Q.
4. Draw the dual of series connected RLC network with a suitable current source.
5. State the condition for reciprocity and symmetry in case of Y parameters.
6. Explain functionality of an attenuator and its types.
7. Find poles and zeros of the impedance of the network shown in Fig.(1) and plot them on the s-plane.

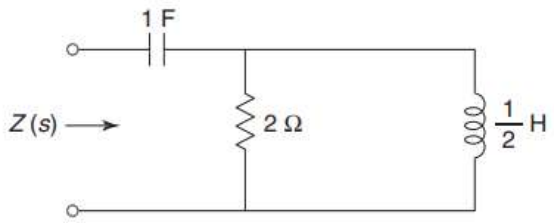


Fig.(1)

8. Test whether the polynomial $s^5 + s^3 + s$ is Hurwitz or not.
9. List out the properties of RC driving point immittance function.
10. State whether the following function is a driving point immittance of LC network or not.

$$Z(s) = \frac{2(s^2+1)(s^2+9)}{s(s^2+2)}$$

PART B

(Answer one full question from each module, each question carries 14 marks)

MODULE I

11. a) Explain the formulation of graph, tree, and incidence matrix using suitable examples. Hence, discuss the procedure of forming reduced incidence matrix and its advantages. (8)

b) How many trees are possible for the graph of the network of Fig. (2) and draw all possible trees. (6)

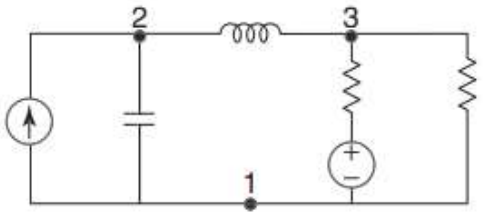


Fig. (2)

OR

12. a) For the network shown in Fig (3) draw the graph and write down the tie-set matrix. (7)

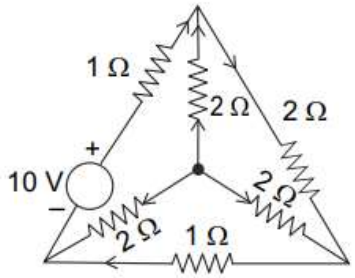
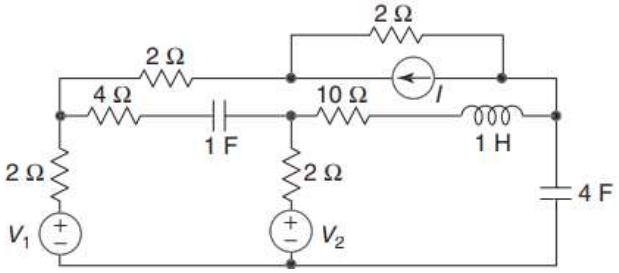


Fig (3)

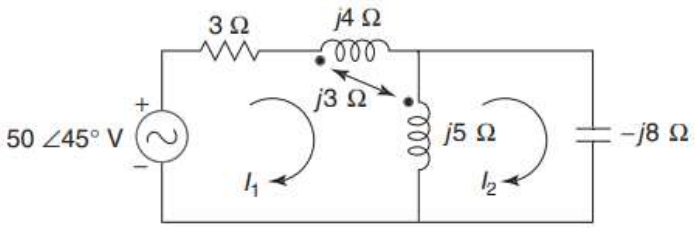
b) For the network shown in Fig(4), draw the oriented graph and write the (a) incidence matrix, (b) tieset matrix, and (c) f-cutset matrix (7)



Fig(4)

MODULE II

13. a) For the network shown in Fig(5), write down the tie set matrix and obtain the network equilibrium equation in matrix form using KVL. (9)



Fig(5)

b) Explain the properties of incidence matrix. (5)

OR

14. a) For the network shown in Fig. (6), write down the f-cutset matrix and obtain the network equilibrium equation in matrix form using KCL. (10)

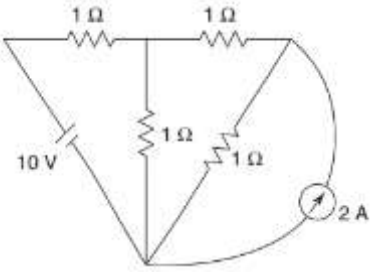


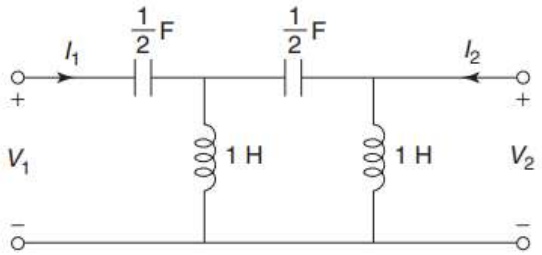
Fig. (6)

b) Explain the principle of V shifting in graph theory with example. (4)

MODULE III

15. a) The Z parameters of a two-port network are Z_{11} = 20 Ω, Z_{22} = 30 Ω, Z_{12} = Z_{21} = 10 Ω. Find Y and ABCD parameters. (7)

b) Find h-parameters for the network shown in Fig(7) . (7)



Fig(7)

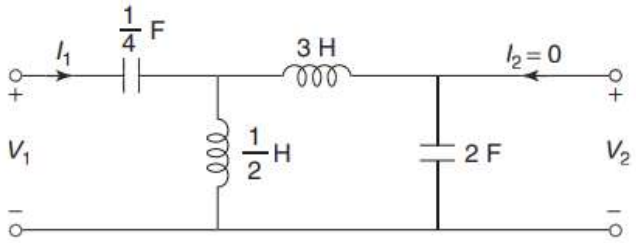
OR

16. a) A low-pass filter is composed of a symmetrical π section. Each series branch is a 0.02 H inductor and shunt branch is a 2 μF capacitor. Find (a) cut-off frequency, (b) nominal impedance, (c) characteristic impedance at 200 Hz and 2000 Hz, (d) attenuation at 200 Hz and 2000 Hz, and (e) phase shift constant at 200 Hz and 2000 Hz. (8)

b) Design a symmetrical lattice attenuator to have characteristic impedance of 800 Ω and attenuation of 20 dB (6)

MODULE IV

17. a) Find the network functions $\frac{V_1}{I_1}$, $\frac{V_2}{V_1}$ and $\frac{V_2}{I_1}$ for the ladder network shown in Fig(8) (9)



Fig(8)

b) Explain the stability of the network related to the location of poles in the s plane. (5)

OR

18. a) Define positive real function and mention its properties (6)

b) Test whether F(s) is positive real function or not.

$$F(s)=\frac{s^3+6s^2+7s+3}{s^2+2s+1}$$ (8)

MODULE V

19. Realise Foster forms of the following LC impedance function.

$$Z(s)=\frac{(s^2+1)(s^2+3)}{s(s^2+2)}$$ (14)

OR

20 Realise Cauer forms of the following LC impedance function.

$$Z(s)=\frac{10s^4+12s^2+1}{2s^3+2s}$$ (14)

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