

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2044

Roll No.

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B.Tech

(SEM III) ODD SEMESTER THEORY EXAMINATION 2009-10 NETWORK ANALYSIS & SYNTHESIS

Time : 3 Hours]

[Total Marks : 100

Note : Attempt all questions. All questions carry equal marks. In case of numerical problems make suitable assumptions wherever required.

1 Attempt any **four** parts : **5×4=20**

- (a) Define tree, co-tree, twig, link and incidence matrix taking a suitable example.
- (b) Explain the fundamental cut-set matrix taking a suitable example.
- (c) Derive the relationship between fundamental tie-set matrix, impedance matrix, loop current matrix and loop emf matrix.
- (d) For the network shown in the **fig. 1** below, write down the tie-set matrix.

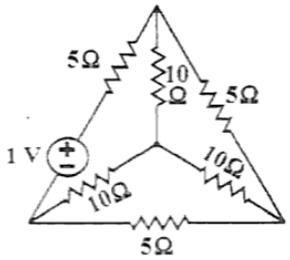


Fig. 1

- (e) Explain the concept of duality. What relationship has duality with the incidence matrix ?



- (f) Find the dual of the following network shown in fig. 2.

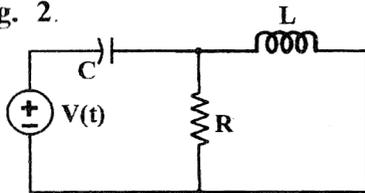


Fig. 2

2 Attempt any **four** parts : 5×4=20

- (a) Find the current in the $(1 + j1) \Omega$ resistor across A, B of the network shown in fig. 3 using thevenin's theorem.

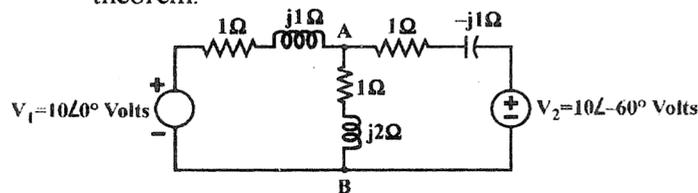


Fig. 3

- (b) Obtain the Thevenin's equivalent circuit for the network shown in fig. 4.

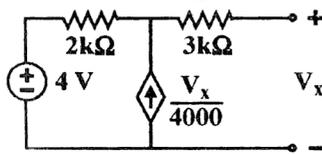


Fig. 4

- (c) Verify Tellegen's theorem for the network shown in fig. 5.

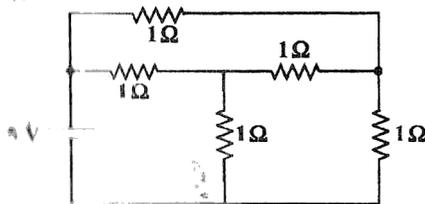


Fig. 5

- (d) Find the power delivered by the two sources to the circuit shown in fig. 6.

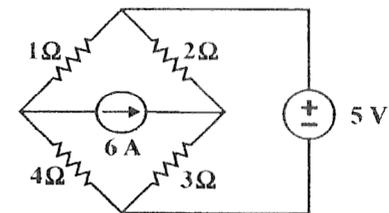


Fig. 6

- (e) State and prove the Maximum power transfer theorem for AC circuits.
 (f) State and prove Millman's theorem.

3 Answer any **two** parts : 10×2=20

- (a) Transform current $i(s)$ of a network is given by

$$I(s) = \frac{2s}{(s+1)(s+2)}$$

Plot the poles and zeros in the s-plane and hence obtain time-domain response of it.

- (b) Explain the complete procedure for making a Bode Plot for different types of transfer function.
 (c) Show that the voltage transfer function of the network shown in fig. 7 can be written as

$$\frac{V_2(s)}{V_1(s)} = \frac{1}{R_1 C_2} \frac{s}{s^2 + \frac{R_1 C_1 + R_2 (C_1 + C_2)}{R_1 R_2 C_1 C_2} s + \frac{1}{R_1 R_2 C_1 C_2}}$$

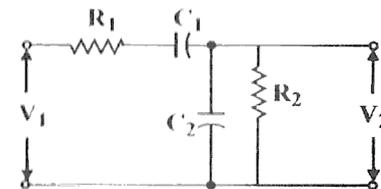


Fig. 7

4 Attempt any two parts : 10×2=20

- (a) Explain the concepts of reciprocity and symmetry. Derive the above conditions for h and ABCD parameters.

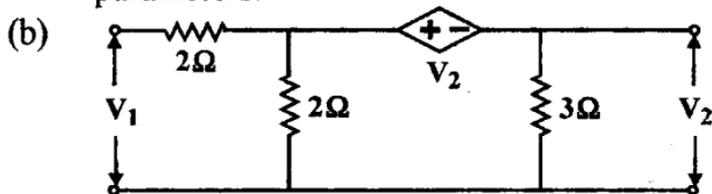


Fig. 8

Find the Y and Z parameters of the network in fig. 8.

- (c) Find the h parameters of the network shown in fig. 9.

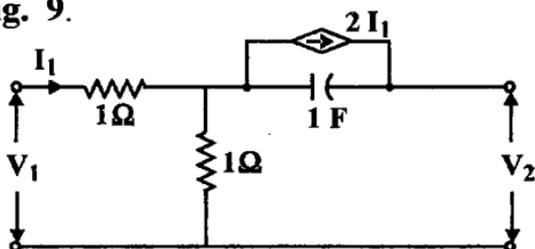


Fig. 9

5 Answer any two parts : 10×2=20

- (a) Define positive real function and mention its properties. Also write the properties of RL, RC and LC driving point functions.
- (b) Synthesize the Foster I and II forms of realization of the following driving point function

$$Z_0(s) = \frac{2s^2 + 12s + 16}{s^2 + 4s + 3}$$

- (c) Design constant - K low pass T and π section filters to be terminated in 600Ω having cut-off frequency 3 kHz.

