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

**PAPER ID : 0208** **Roll No.**

**B.Tech.**

(SEM IV) EVEN SEMESTER THEORY EXAMINATION, 2009-2010

## NETWORK ANALYSIS AND SYNTHESIS

*Time : 3 Hours* *Total Marks : 100*

**Note :** *Attempt **all** questions.*

**1.** Attempt **any four** parts :

(a) Explain the following terms : **(5)**

(i) Graph,

(ii) Tree,

(iii) Reduced incidence matrix taking a suitable example.

(b) Draw the graph of the network shown above in fig. 1. Write the fundamental cut-set and fundamental tie-set Matrices and their ranks. **(5)**

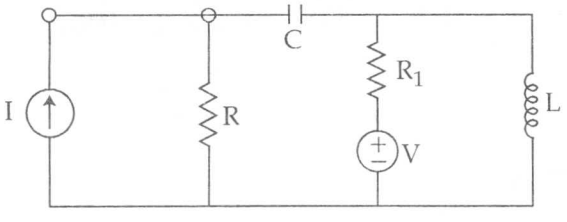


Figure - 1

(c) Derive the KVL in terms of the fundamental tie-set Matrix 'B', impedance Matrix '$Z_b$', branch input voltage source vector $V_s$ and branch input current source vector $T_s$. **(5)**

(d) For the network shown in fig. 2, draw the oriented graph. Write the tie-set schedule and hence obtain the equilibrium equation on loop basis. Calculate the values of branch currents. **(5)**

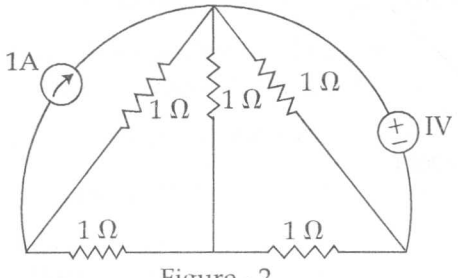


Figure - 2

(e) Draw the dual of the network shown in fig. 3 below : (5)

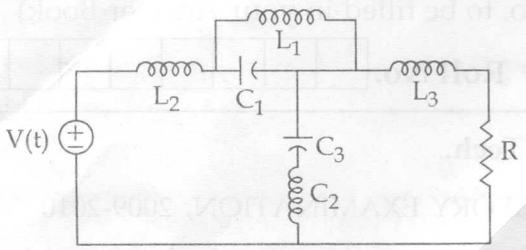


Figure - 3

(f) Prove that two graphs are said to be dual of each other if the incidence Matrix of any one of them is the circuit Matrix of the other. (5)

2. Attempt **any four** parts :

(a) State and prove the maximum power transfer theorem with complex load and source impedances. (5)

(b) Determine the power delivered to the circuit by the two sources in fig. 4. (5)

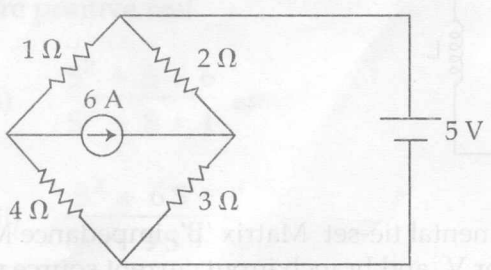


Figure - 4

(c) Determine the voltage source $V_1$ for which the current through the voltage source $V_2$ is zero in fig. 5 below : (5)

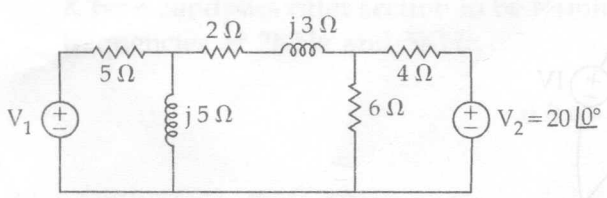


Figure - 5

(d) State and prove Tellegen's theorem. **(5)**

(e) Find the thevenin's equivalent circuit across the terminals a-b in the fig. 6 shown below : **(5)**

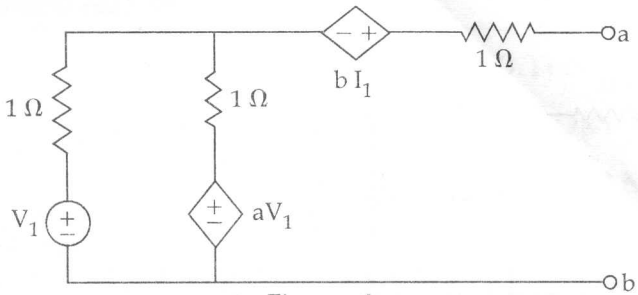


Figure - 6

(f) Write the loop equations of the circuit shown below in fig. 7 and find the voltage $V_x$. **(5)**

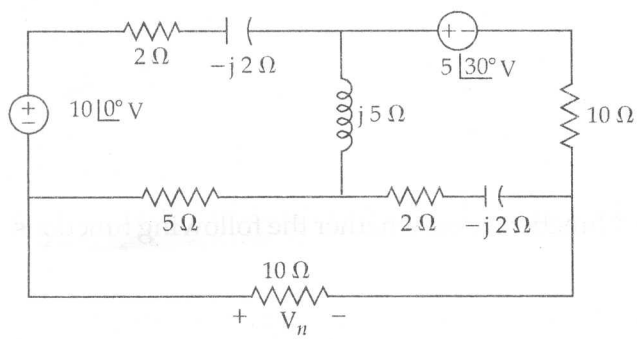


Figure - 7

**3.** Attempt **any two** parts :

(a) Write the necessary conditions for driving point and transfer functions and explain. **(10)**

(b) A current transfer function is given by : **(10)**

$$I(S) = \frac{5S}{(S+4)(S^2+2S+2)}$$

Obtain the time response through pole - zero plot.

(c) (i) Find the number of closed loop poles in the left half S - plane for a system whose characteristic equation is : **(10)**

$$S^4 + 2S^3 + 3S^2 + 4S + 5 = 0$$

Comment on the stability of the system.

(ii) What are poles and zeroes ? How does the location of poles in the s-plane affect the system stability ? Explain.

4. Attempt **any two** parts :

(a) Explain in detail with figures (without proofs) the interconnection of all two-port networks. **(10)**

(b) Find the open circuit and short circuit parameters of the network shown below in fig. 8. **(10)**

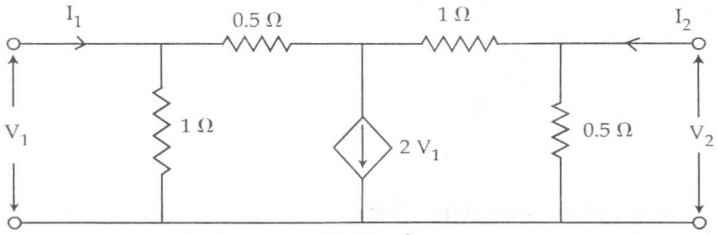


Figure - 8

Comment on the symmetry and reciprocity of the network.

(c) Design a symmetrical lattice network for a following Z-parameter Matrix. **(10)**

$$Z = \begin{bmatrix} 14/5 & 2/5 \\ 2/5 & 6/5 \end{bmatrix}$$

5. Attepmt **any two** parts :

(a) Write the properties of Positive Real function. Test whether the following functions are positive real. **(10)**

(i) $\dfrac{S^2 + S + 6}{S^2 + S + 1}$ and

(ii) $\dfrac{S^2 + 6S + 5}{S^2 + 9S + 14}$

(b) Synthesize the Foster first and second forms of LC driving - point impedance. **(10)**

$$Z(S) = \frac{(S^2 + 1)(S^2 + 9)}{S(S^2 + 4)}$$

(c) What is the difference between active and passive filters ? Design a constant K type bandpass fitter section to be terminated in 600 Ω resistance having cut-off frequencies of 2KHz and 5KHz. **(10)**

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