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

PAPER ID : 2044   Roll No.

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.
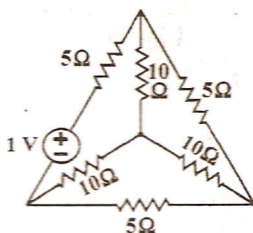

Fig. 1

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

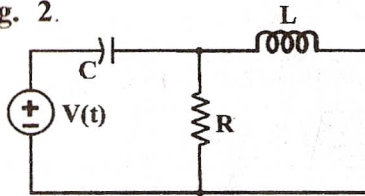(f) Find the dual of the following network shown in **fig. 2**.

Fig. 2

2 Attempt any **four** parts : 5×4=20

(a) Find the current in the $(1 + j\,1)\,\Omega$ resistor across A, B of the network shown in **fig. 3** using thevenins theorem.

Fig. 3
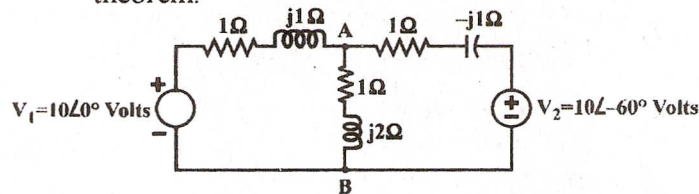
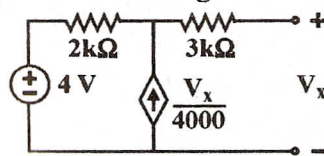(b) Obtain the Thevenin's equivalent circuit for the network shown in **fig. 4**.

Fig. 4

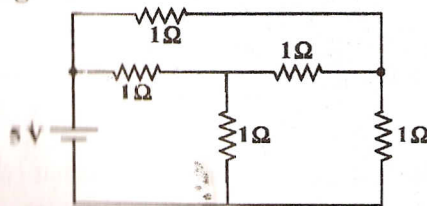(c) Verify Tellegen's theorem for the network shown in **fig. 5**.

Fig. 5

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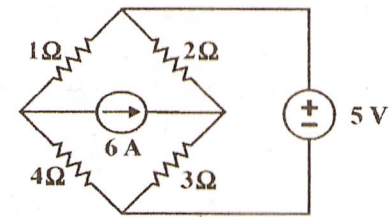

Fig. 6

(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

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

$$\frac{V_2(S)}{V_1(S)} = \frac{1}{R_1 C_2}\,\frac{S}{S^2 + \dfrac{R_1 C_1 + R_2(C_1 + C_2)}{R_1 R_2 C_1 C_2}\,S + \dfrac{1}{R_1 R_2 C_1 C_2}}.$$
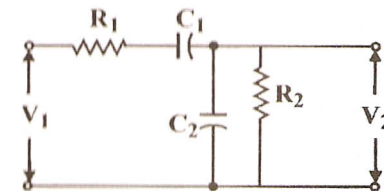

Fig. 7

4 Attempt any **two** parts : $10 \times 2 = 20$

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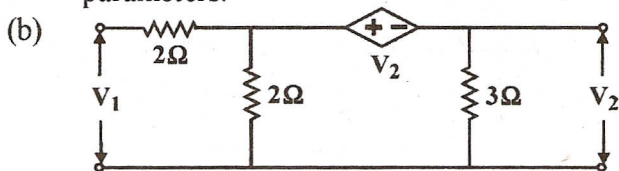
(b)

Fig. 8

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

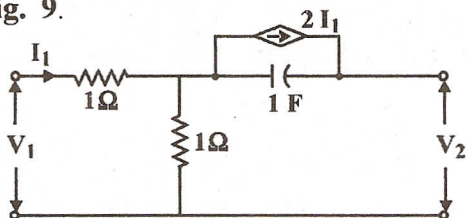(c) Find the h parameters of the network shown in **fig. 9**.

Fig. 9

5 Answer any **two** parts : $10 \times 2 = 20$

(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 $600 \; \Omega$ having cut-off frequency 3 kHz.