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

Paper ID : 121311 Roll No. | | | | | | | | | | |

B. TECH.

(SEM. III) THEORY EXAMINATION, 2015-16

NETWORK ANALYSIS AND SYNTHESIS

[Time:3 hours] **[Total Marks:100]**

Section-A

1. Attempt **all** parts. All parts carry equal marks. Write answer of each part in short : (2x10=20)

   (a) Write down the properties of incidence matrix.

   (b) What is duality ?

   (c) How is Tellegen's theorem related to KVL and KCL.

   (d) Briefly describe the principle of superposition.

   (e) For the given network function, draw the pole zero diagram and comment on stability.

$$V(s) = \frac{5(s+5)}{(s+2)(s+7)}$$

(f) What are the necessary conditions for the stability of a system ?

(g) What are applications of transmission parameters?

(h) For a symmetric lattice network the value of series impedance is 3Ω and that of the diagonal impedance is 5Ω. What will be the Z parameters of the network ?

(i) What is the difference between band pass and band elimination filter ?

(j) What are the required parameters of an ideal filter?

Section-B

Note: Attempt **any five** questions from this section :

(10x5=50)

2. (a) For the given reduced incidence matrix. Draw the graph and hence obtain the f-cutset matrix

$$\begin{bmatrix} 0 & 0 & 1 & 1 & 1 & 0 & -1 \\ 0 & 1 & 0 & 0 & -1 & 1 & 1 \\ -1 & 0 & 1 & 0 & 0 & -1 & 0 \end{bmatrix}$$

(b) A network graph has three basic cutsets and six basic loops. Draw (i) the oriented network graph having all nodes in one line (ii) all the six basic loops

3. Find the current through 10Ω resistor using the venin theorem for the fig.1

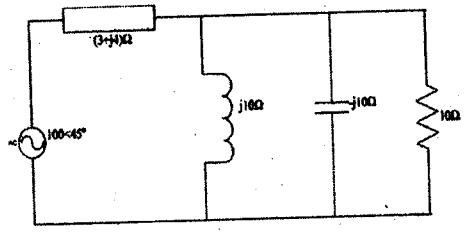

Figure 1

4. (a) State and prove Millman's theorem.

(b) Determine the Norton's equivalent circuit of the network shown in fig.2

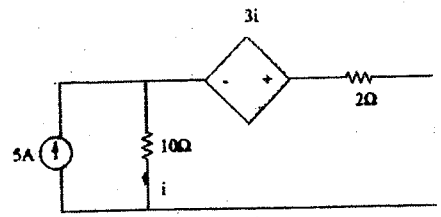

Figure 2

5. (a) Write the properties of the driviing point ,function and transfer function.

(b) Apply Routh's Hurwitz criterion to the given polynomial and determine the number of root with (i) positive real parts (ii) zero real parts (iii) negative real parts

6. Obtain the image parameters of the symmetric lattice network given in fig. 3

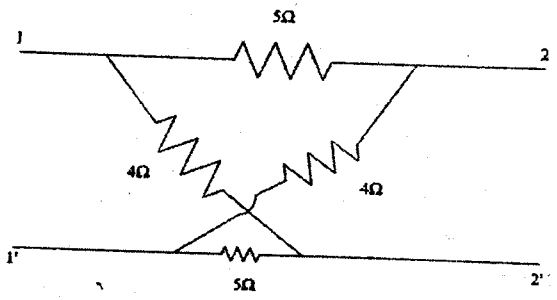

Figure 3

7. The hybrid parameters of a two port netwrok shown in fig.4 are $h_{11} = 1k\Omega$, $h_{12} = 0.003$, $h_{21} = 100$, $h_{22} = 50\mu\Omega$. Find V_2 and Z parameters of the network

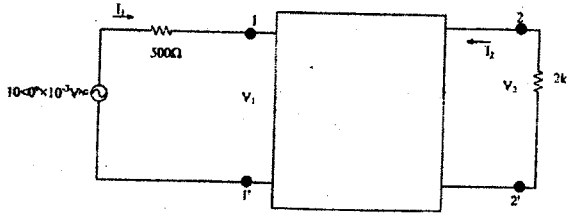

Figure 4

8. Design a (i) low pass filter and (ii) high pass filter (Both T and ∏ section for i and ii having a cut off frequency of 2kHz to operate with the load resistance of 600 Ω.

9. Find the first and second foster forms of the function

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

Section-C

Attempt **any two** questions from this section. (15x2=30)

10. (a) Write the nnetwork equlibrium based on KVL and KCL.

(b) Determine the currents in all the branches of the network shown in fig.5 using node analysis method of the graph theory.

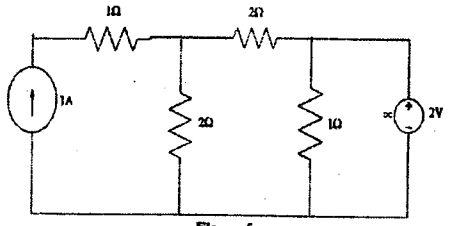

Figure 5

11. (a) State and prove the maximum power transfer theorem applied to the AC circuits.

(b) For the network shown in fig.6, determine the transfer function $G_{21}(s)$, $Z_{21}(s)$. Also find the driving point impedance $Z_{11}(s)$.

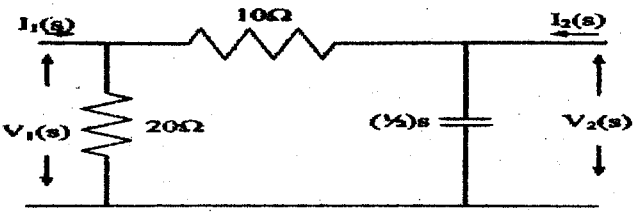

Figure 6

12. For the given network function, draw the pole zero diagram and hence obtain the time response I(t)

$$I(s) = \frac{5s}{(s+1)(s^2+4s+8)}$$

—x—