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

PAPER ID : 0208 Roll No.

B. Tech.

(SEM. IV) THEORY EXAMINATION 2011-12

NETWORK ANALYSIS AND SYNTHESIS

Time : 3 Hours *Total Marks : 100*

Note : Attempt ***all*** questions. Each question carries equal marks.

1. Answer any ***three*** parts of the following : **($6^2/_3 \times 3 = 20$)**

   (a) What do you mean by "THE GRAPH OF A NETWORK" ? Also mention its significances and limitations.

   (b) Explain the following :

   (i) PLANAR GRAPH

   (ii) TREE

   (iii) CO-TREE

   (iv) REDUCED INCIDENCE MATRIX

   Also mention their importances in the circuit theory.

   (c) Consider the network shown in Fig. 1.

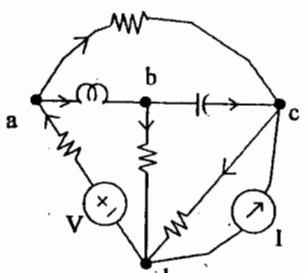

Fig. 1

(i) Draw the oriented graph of above network shown in Fig. 1.

(ii) Determine the incidence matrix and reduced incidence matrix of above network shown in Fig. 1.

(iii) Draw and explain the Cut-set and Tie-set schedule of above network shown in Fig. 1.

(d) What do you mean by "DUALITY OF GRAPH OF THE NETWORK" ? Also mention its utilities and drawbacks.

(e) What do you understand by "LINEAR GRAPH" and "CO-LINEAR GRAPH" of the given networks ? Explain in detail.

2. Answer any *two* parts of the following : **(10×2=20)**

(a) State and explain "MAXIMUM POWER TRANSFER THEOREM" in ac network. Also mention its applications and drawbacks.

Consider the network shown in Fig. 2 :

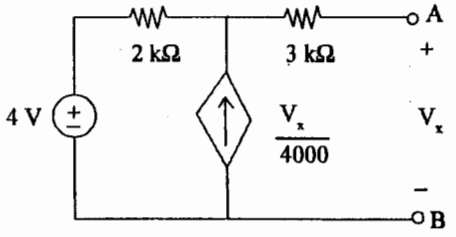

Fig. 2

(i) Obtain the Thevenin's equivalent circuit for the network shown in Fig. 2.

(ii) Obtain the Norton's equivalent circuit from the Thevenin equivalent circuit for the network shown in Fig. 2.

(b) State and explain "SUPERPOSITION THEOREM". Show that the superposition theorem is based on linearity and homogeneous of the networks. Consider the network shown in Fig. 3.

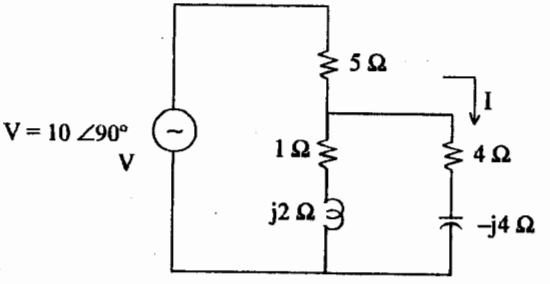

Fig. 3

Verify Reciprocity Theorem for V and I for the network shown in Fig. 3.

(c) State and explain Millman's Theorem. Also mention its significances and limitations.

Consider the network shown in Fig. 4.

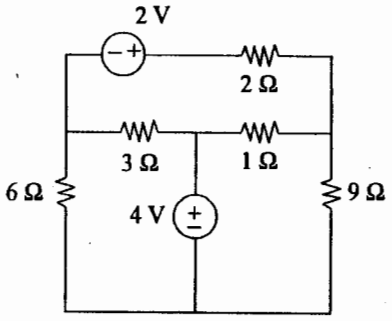

Fig. 4

Verify the Tellegen's Theorem for the network shown in Fig. 4.

3. Answer any *two* parts of the following : **(10×2=20)**

(a) Define the following terms regarding two-port networks :

(i) [z]-parameters

(ii) [h]-parameters

(iii) [g]-parameters

(iv) [ABCD]-parameters

(v) [A'B'C'D']-parameters.

Also mention their importances in circuit theory.

(b) Consider the network shown in Fig. 5.

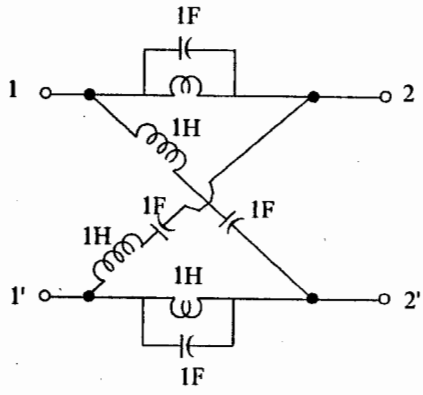

Fig. 5

Determine open circuit parameters and short circuit parameters of the above network shown in Fig. 5.

(c) For a network the equations are :

$$I_1 = 0.5\,V_1 - 0.2\,V_2$$
$$I_2 = -0.2\,V_1 + V_2$$

Find [Y]-parameters and [ABCD]-parameters of the network. Also find its equivalent Π-network.

4. Answer any *two* parts of the following : **(10×2=20)**

(a) What do you understand by concept of Complex frequency ? Also discuss the concept of poles and zeros of a transfer function. What are the significances of poles and zeros of a network functions ? Define scale factor.

(b) Consider the network shown in Fig. 6.

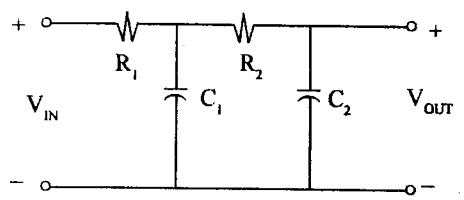

Fig. 6

Determine the transfer function $\left(\frac{V_{OUT}}{V_{IN}}\right)$ of above network shown in Fig. 6.

(c) A two terminal network consisting of a coil having an inductance L and resistance R shunted by a capacitor C. The poles and zeros of the driving point impedances function Z(s) of this network are shown on Fig. 7.

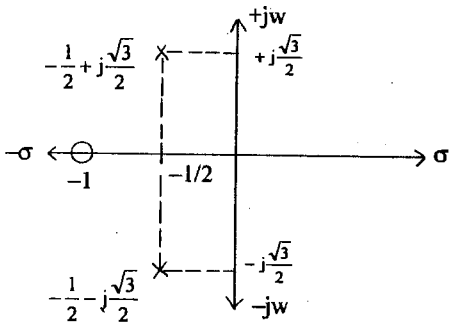

Fig. 7

If Z(j0) = 1, determine the values of R, L & C.

5. Answer any *two* parts of the following : **(10×2=20)**

(a) A function is given by :

$$F(s)=\frac{s^2+a_1s+a_0}{s^2+b_1s+b_0}$$

where $[a_0, a_1, b_0$ and $b_1 \geq 0]$ are real and positive numbers. Show that :

$$a_1b_1 \geq [\sqrt{a_0}-\sqrt{b_0}]^2$$

if F(s) is positive real function.

(b) Find the range of values of "m" in polynomials P(s), so that P(s) is Hurwitz :

$$P(s) = 2s^4 + s^3 + ms^2 + s + 2.$$

Also enlist the properties of RL driving point function.

(c) (i) Synthesize in FOSTER-I and CAUER-II forms :

$$Z(s)=\frac{(s+5)(s+7)}{(s+1)(s+6)(s+8)}.$$

(ii) Differentiate passive and active filters. Also define low pass, high pass, band pass and band elimination filters with the help of their attenuation characteristics.