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

PAPER ID : 0208 Roll No. | | | | | | | | | | |

B. Tech.

(SEM. IV) THEORY EXAMINATION 2010-11

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 :— **($3\times6^2/_3=20$)**

(a) Define the following terms :—

(i) Tree

(ii) Co-tree

(iii) Cutset

(iv) Incidence matrix

(v) Planer and non-planer graph.

(b) A reduced incidence matrix of a graph is given by

$$[A]=\begin{bmatrix} 1 & 1 & 0 & 0 & 0 & 1 \\ 0 & -1 & 1 & -1 & 0 & 0 \\ -1 & 0 & -1 & 0 & -1 & 0 \end{bmatrix}$$

Obtain and draw number of possible trees.

(c) Define f-cutset matrix and develop the f-cutset matrix of network shown in Fig. 1 (c).

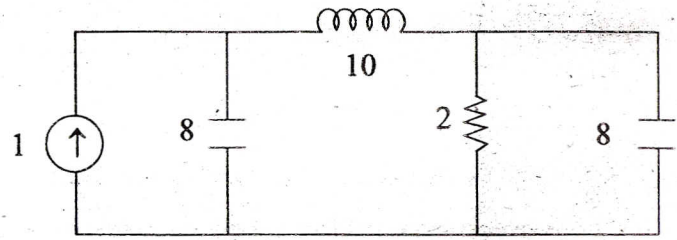

Fig. 1 (c)

(d) Show that f-cutset and f-loop matrix are orthogonal to each other.

(e) Draw graph of the network shown in Fig. 1 (e). Also write down tie set matrix.

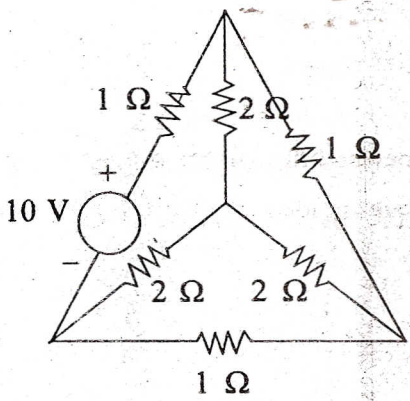

Fig. 1 (e)

2. Answer any **THREE** parts of the following :— **(3×6²/₃=20)**

(a) Define Thevenin's theorem and Superposition theorem. Also enlist limitations of each.

(b) State maximum power transfer theorem. Also prove that in any network efficiency of the system will be 50% at maximum power transfer condition.

(c) Determine the current through the branch AB of the network shown in Fig. 2 (c) using Millman's theorem.

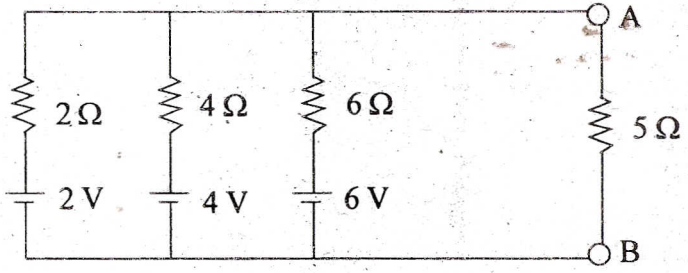

Fig. 2 (c)

(d) Write advantages of star-delta transformation in circuit analysis. Also find out the values of resistance R_1, R_2 and R_3 in a network shown in Fig. 2 (d) using star-delta transformation.

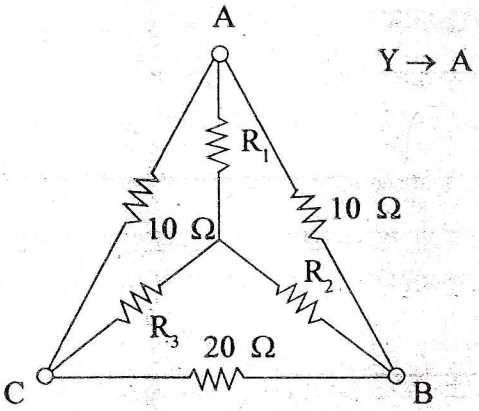

Fig. 2 (d)

(e) Using superposition theorem, determine the current flowing through AB in 2 Ω resistor.

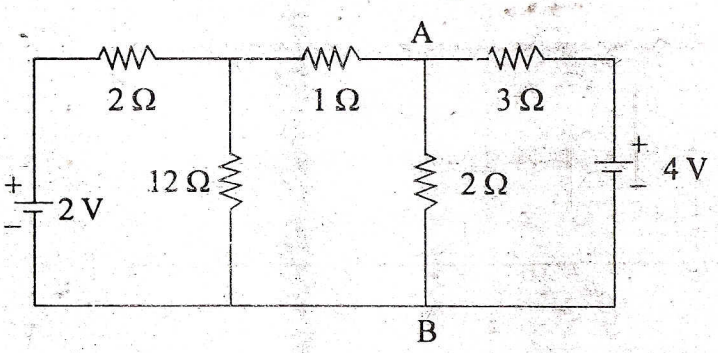

Fig. 2 (e)

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

(a) If 2 two-port networks are connected in parallel, show that resultant Y-parameters are the sum of corresponding Y-parameters of 2 networks.

(b) For a two-port network, Z-parameters are $Z_{11} = 50\ \Omega$, $Z_{12} = Z_{21} = 25\ \Omega$ and $Z_{22} = 30\ \Omega$.

Compute ABCD parameters of network.

(c) Obtain z-parameters of the network shown in Fig. 3 (c).

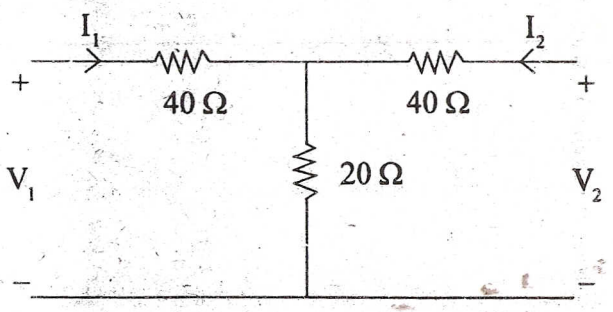

Fig. 3 (c)

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

(a) Explain Routh-Hurwitz criterion for stability assessment of the system. Also check stability of the system with characteristic equation :

$$2s^5 + s^4 + 6s^3 + 3s^2 + s + 1 = 0.$$

(b) Draw pole-zero diagram of the system given by

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

and hence obtain time-domain response of the system.

(c) Calculate open-circuit transfer impedance V_2/I_1 and open-circuit voltage ratio V_2/V_1 for a ladder network shown in Fig. 4 (c).

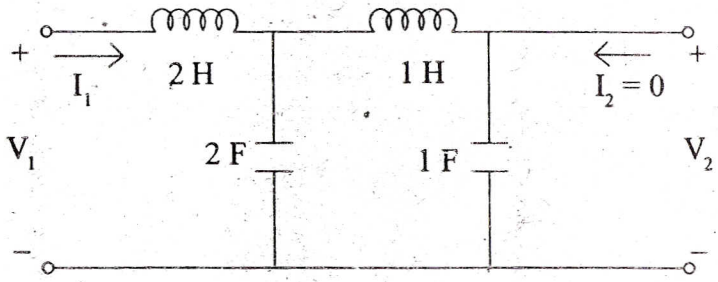

Fig. 4 (c)

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

(a) Define positive real function. Also write conditions for positive realness of the function.

Check given polynomial P(s) is Hurwitz or not ? Where

$$P(s) = s^7 + 2s^6 + 2s^5 + s^4 + 4s^3 + 8s^2 + 8s + 4.$$

(b) Explain the advantages of active filter in comparison to passive filter.

Also realise the network Y(s) using Cauer I and II form, where

$$Y(s) = \frac{4s^2 + 6s}{s+1}.$$

(c) Determine cut-off frequency of each high-pass filters shown in Fig. 5 (c) (i) and 5 (c) (ii).

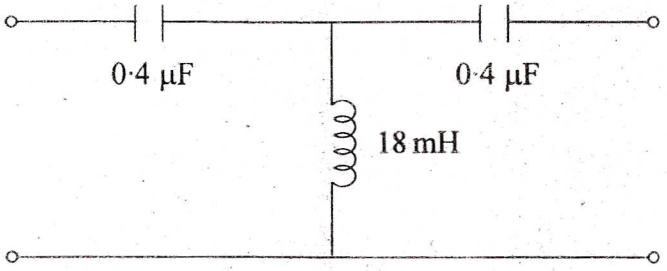

Fig. 5 (c) (i)

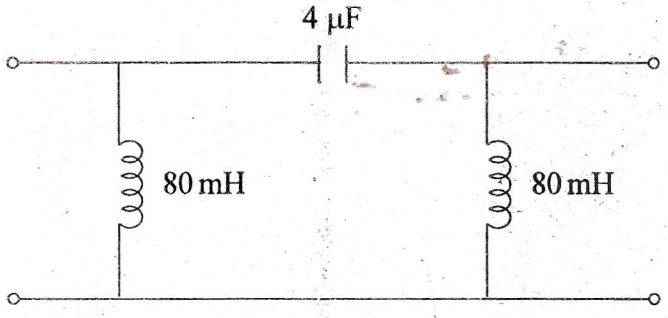

Fig. 5 (c) (ii)