Printed Pages : 7

EE-301

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

PAPER ID : 121301

Roll No.

B. Tech.

(SEM. III) (ODD SEM.) THEORY EXAMINATION, 2014-15

NETWORK ANALYSIS AND SYNTHESIS

Time : 3 Hours] [Total Marks : 100

Note : Attempt ALL questions.

1 Attempt any four parts : 5×4=20

(a) For a incidence matrix A given below, draw the oriented graph :

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

(b) Explain following terms with reference to network topology :

(i) Tree

(ii) Co-tree

(iii) Incidence matrix

(iv) Oriented graph

(v) Twig and link.

(c) For the network shown in Fig. 1 shown below draw the directed graph. And also find number possible tree.

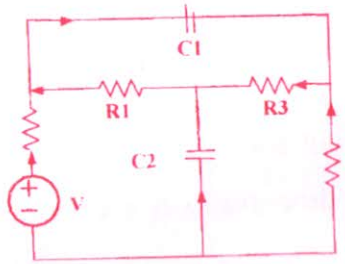

Fig.1

(d) For the network shown in Fig. 2 shown below :

(i) Draw the directed graph

(ii) F-cutset matrix.

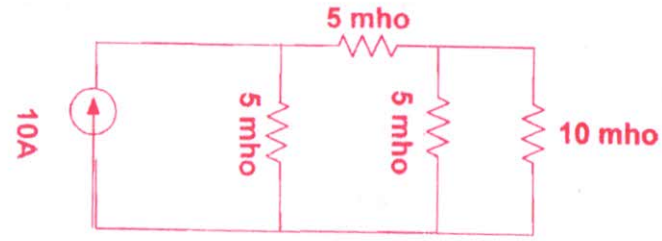

Fig. 2

(e) State the principle of duality. Explain the graphical method to draw dual network.

(f) The fundamental cutest matrix is given as :

$$Q = \begin{array}{c} \\ \\ \\ \\ \end{array} \begin{array}{c} \begin{array}{ccccccc} \multicolumn{4}{c}{\textit{Twig}} & \multicolumn{3}{c}{\textit{Link}} \\ 1 & 2 & 3 & 4 & 5 & 6 & 7 \end{array} \\ \begin{bmatrix} 1 & 0 & 0 & 0 & -1 & 0 & 0 \\ 0 & 1 & 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 & 0 & 1 & 0 \end{bmatrix} \end{array}$$

Draw the oriented graph.

2 Attempt Any Three Questions : $6\frac{2}{3} \times 3 = 20$

(a) State and prove Millman's theorem for the n voltage sources connected in parallel.

(b) State and explain compensation theorem with suitable example.

(c) Determine the current in capacitor C, by the principle of superposition of the network shown below in Fig.3

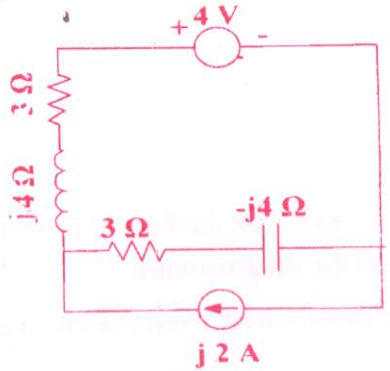

Fig.3.

(d) Determine the maximum power which can be absorbed by a pure resistive load when placed across the output terminal a, b of the network shown below in Fig. 4.

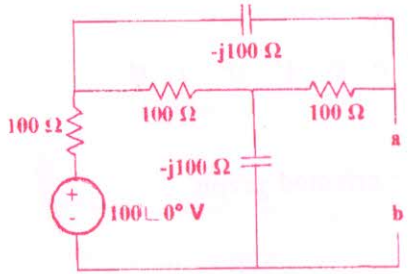

Fig.4

(e) State and prove Tellegen's theorem.

3 Attempt any two parts : **10×2=20**

(a) Write the necessary condition for driving point function and transfer function.

(b) Determine voltage transfer function $V_2(s)/V_1(s)$ for the network shown in **Fig. 5**

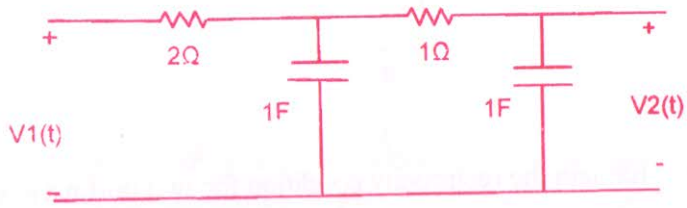

Fig.5

(c) For the ladder network shown in **Fig. 6** find

(i) Driving point input impedance

(ii) Transfer impedance function V_2/I_1

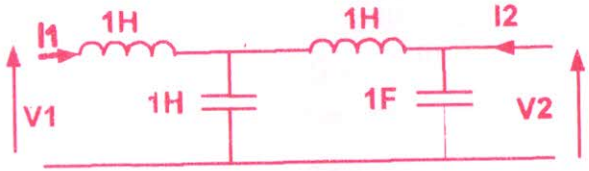

Fig.6

4 Attempt any two parts : 10×2=20

(a) For the network shown in Fig. 7, Find Z-Parameter and hence find transmission parameter.

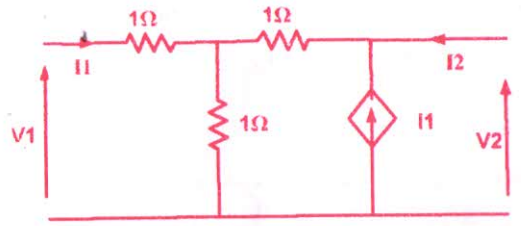

Fig.7

(b) Explain the reciprocity condition for two port network. Also derive the condition for reciprocity for Z, T and h-parameter.

(c) Find Y parameter for the network shown in **Fig. 8**

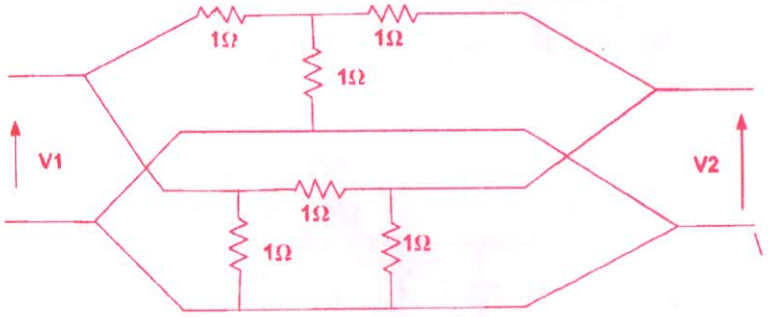

Fig.8

5 Attempt any two parts : 10×2=20

(a) Design a constant k low pass T section filter to be terminated in 600 Ω, having cutoff frequency of 3 kHz. Determine :

(i) The frequency at which the filter is 17.372 dB.

(ii) Attenuation at 6 kHz.

(iii) The characteristic impedance and phase constant at 2 kHz.

(b) An impedance function has the pole and zero diagram shown in Fig. 9. Find impedance function if Z(–4)=3/8 and realize it in Cauer I and Cauer-II form

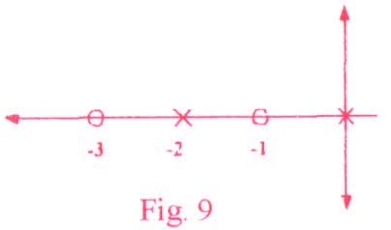

Fig. 9

(c) State the properties of RL driving point impedance function. Also realize the given network impedance function using Foster form I

$$Z(s)=\frac{(s+1)(s+3)}{(s+2)(s+4)}$$