Printed Pages : 4 EEE402

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

PAPER ID : 0208 Roll No.

B.Tech.

(SEMESTER-IV) THEORY EXAMINATION, 2012-13

NETWORK ANALYSIS & SYNTHESIS

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

SECTION – A

1. Attempt **all** question parts. **10 × 2 = 20**

(a) What are the advantages of the graph theoretic method of network analysis ?

(b) What is a fundamental cut-set matrix ?

(c) State and prove reciprocity theorem.

(d) Thevenin's theorem can be applied to calculate current in what type of load ?

(e) Mention the necessary and sufficient condition for the location of poles and zeros in driving point function.

(f) Define transfer impedance and admittance.

(g) For a two port network, y parameters are $y_{11} = 0.1\text{℧}$, $y_{22} = 0.05\ \text{℧}$, $y_{12} = y_{21} = -0.02\ \text{℧}$. Calculate the z parameters of the network.

(h) A two port network is characterized by $V_1 = 10\ I_1 + 5\ I_2$ and $V_2 = 5\ I_1 + 12\ I_2$. Find the transmission parameters A and C.

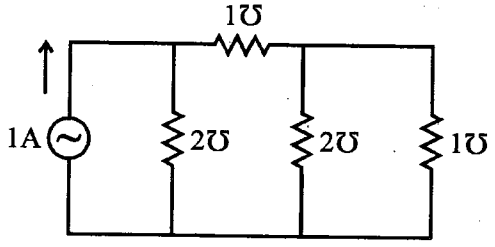
(i) What do we mean by Network synthesis ? How is it different from network analysis ?

(j) Draw the ideal characteristics of low pass, high pass, band pass, band elimination filters.

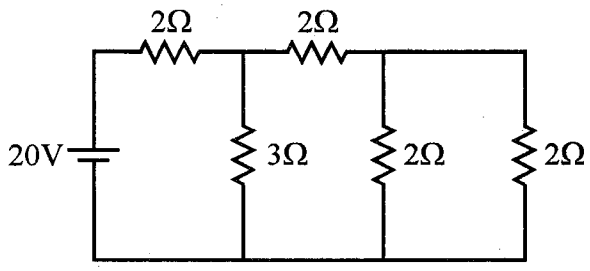
SECTION – B

2. Attempt any **three** question parts : **3 × 10 = 30**

(a) For the network of figure shown below, find the fundamental cut set matrix and hence obtain the KCL equation.



(b) Verify the reciprocity theorem for the network.



(c) Draw the pole zero diagrams for the given network function and hence obtain $v(t)$. Verify the result analytically.

$$V(s) = \frac{20s}{(s+2)(s+5)}$$

(d) The Z parameters of a two port network are $Z_{11} = 50\Omega$, $Z_{22} = 30\ \Omega$ and $Z_{12} = Z_{21} = 20\Omega$. Determine the Y parameter, ABCD parameters and the image parameters of the network.

(e) Design a constant k – type band pass filter section to be terminated in 600 ohm resistance having cut off frequencies of 2 kHz and 5kHz.

SECTION – C

Attempt **all** questions : **5 × 10 = 50**

3. Attempt any **two** parts : **2 × 5 = 10**

(a) For the resistive network shown in Fig. 1, draw a graph, select a tree and obtain tie-set matrix. Write down the KVL equations from the tie-set matrix.

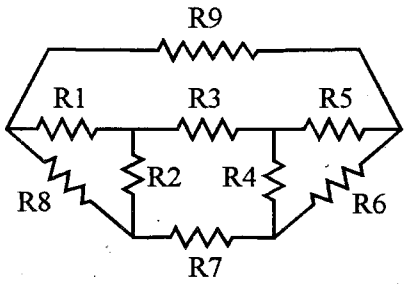
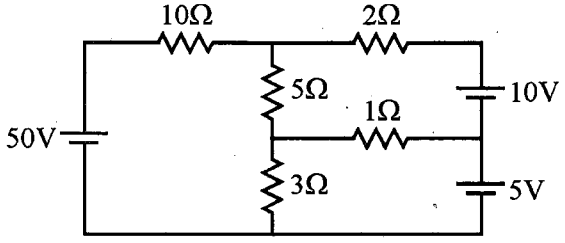


Fig. 1

(b) State and prove Norton's theorem.

(c) Determine the current flowing through 1Ω resistance using mesh analysis.



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4. Attempt any **one** part : **1 × 10 = 10**

(a) Find the impedance matrix and mesh equations of the network shown in fig. 2 and obtain the current through 25 ohms resistance.

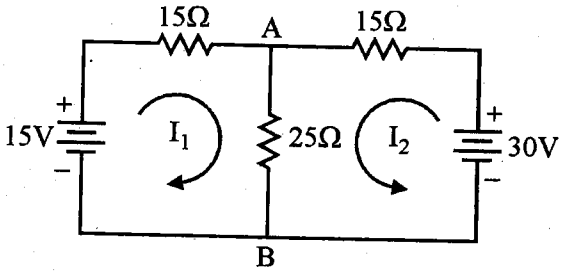

Fig. 2

(b) Use pole zero diagram to find i(t). Verify the result analytically.

$$I(s) = \frac{s^2 + 6s + 5}{s(s^2 + 4s + 5)}$$

5. Attempt any **one** part : **1 × 10 = 10**

(a) Find the open circuit parameter of the two port network shown in Fig. 3.

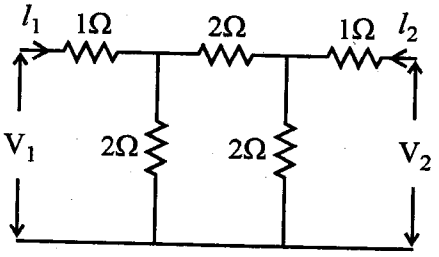

Fig. 3

(b) Two identical sections, as shown in Fig. 4 are connected in parallel. Determine the Y parameters of the combination.

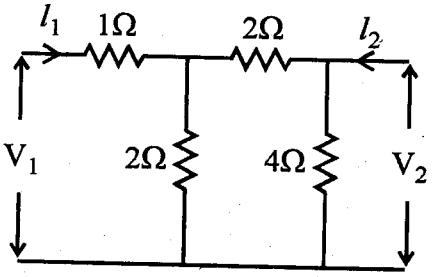

Fig. 4

6. Attempt any **one** part : **1 × 10 = 10**

(a) An impedance function at the input of a network is represented by

$$Z(s) = \frac{s^2 + 5s + 4}{s^2 + 2s}$$

Express it in both the Foster forms.

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(b) Realise the following function in Cauer I and II forms of LC networks.

$$Z(s) = \frac{s(s^2 + 4)}{2(s^2 + 1)(s^2 + 9)}$$

7. Attempt any **two** parts : **2 × 5 = 10**

(a) Design a m-derived low pass filter having a cut-off frequency of 1 kHz, design impedance of 400 ohms, and resonant frequency 1100 Hz. Obtain T-section FILTERS.

(b) Obtain a T and π section constant high pass filter having cut-off frequency of 2kHz and nominal impedance Ro = 500 ohms. Also find :

(i) Its characteristics impedance and phase constant at 24 kHz and

(ii) attenuation at 4kHz.

(c) Check the positive realness for the given functions

$$F(s) = \frac{s^2 + 10s + 4}{s + 2}$$