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

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

B.Tech.

(SEMESTER-IV) THEORY EXAMINATION, 2011-12

NETWORK ANALYSIS & SYNTHESIS

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

Note : Attempt all the Sections. Section – A carry **20** marks, Section – B **30** marks and Section – C **50** marks.

Section – A

1. Attempt **all** parts. Each part carry **2** marks. **10 × 2 = 20**

(a) Write relation between branch voltage matrix $[V_O]$, Twing Voltage matrix $[V_T]$ and Node voltage matrix $[V_N]$ in graph theory.

(b) What is loop matrix ?

(c) Explain Reciprocal Networks, Symmetrical Networks.

(d) What is Laplace transform ? Define its applications.

(e) What are the conditions to be satisfied for a polynomial P(s) to be Hurwitz ?

(f) Explain ABCD parameters in terms of y-parameters.

(g) Differentiate between Foster form and Cauer form.

(h) Design a π type attenuator to give 20 db attenuation and to have a characteristic impedance of 100 Ω.

(i) T section of an m-derived LP filter is shown as follows :

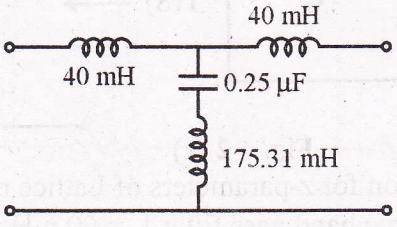

Fig. – 1 (i)

Calculate K.

(j) Give examples for balanced networks. Why are they called so ?

Section – B

2. Attempt any **three** parts. $3 \times 10 = 30$

(a) (i) Write down the fundamental loop matrix of the network shown in Fig. 2(a)(i).

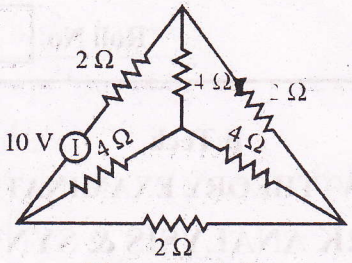

Fig. – 2 (a) (i)

(ii) Using graph theory, find node voltage at (A) and (B) for the network shown in Fig. 2(a)(ii).

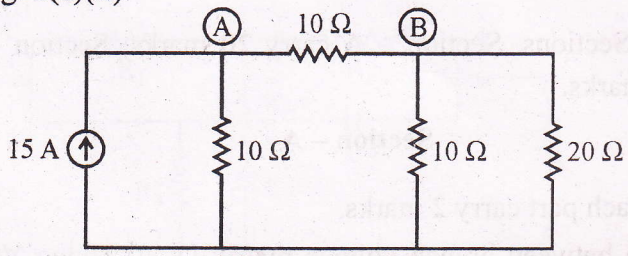

Fig. – 2 (a) (ii)

(b) Verify the reciprocity theorem for the circuit shown in Fig. 2(b).

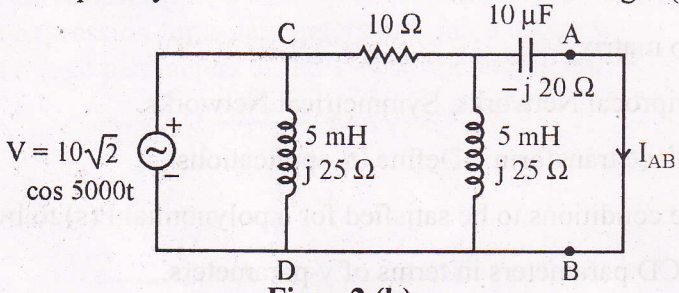

Fig. – 2 (b)

(c) Compute the driving point impedance for the network shown in Fig. 2(c).

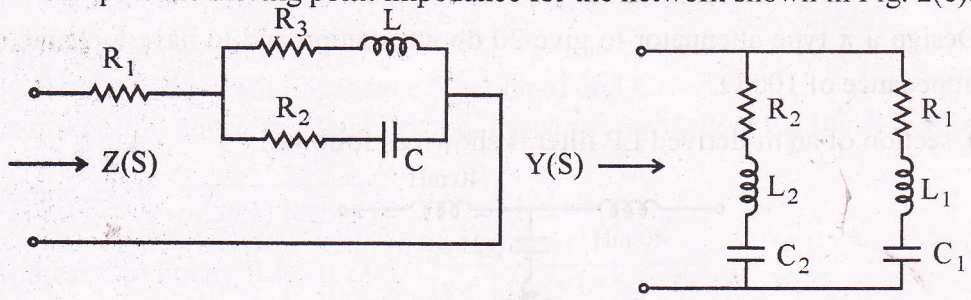

Fig. – 2 (c)

(d) Determine the expression for z-parameters of Lattice network.

(e) In a series resonance type band pass filter L = 60 mHz, C = 150 nF and R = 70 Ω. Determine

(i) Resonance frequency in Hz

(ii) Bandwidth

(iii) Cut-off frequencies. Assume the load resistance to be 600 Ω.

Section – C

3. Attempt any **one** of the following : **5 × 10 = 50**

(a) Define the following related to Graph Theory :

(i) Tree

(ii) Co-tree

(iii) Basic cut-set

(iv) Loop

(v) Incidence matrix

(b) Draw the oriented graph of the network shown in the following Fig. Select loop current variables and write the network-equilibrium equation in matrix form :

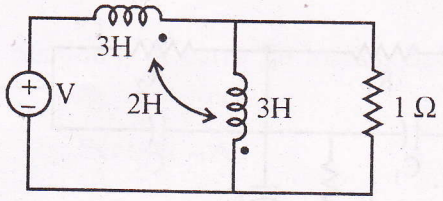

Fig. – 3 (b)

4. Attempt any **one** of the following :

(a) By the superposition theorem calculate the current through the (2 + j3) Ω impedance branch of the circuit in the following :

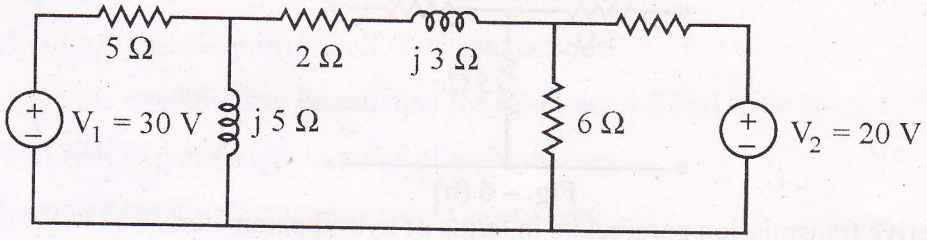

Fig – 4 (a)

(b) Verify Tellegen's theorem for the pair of network.

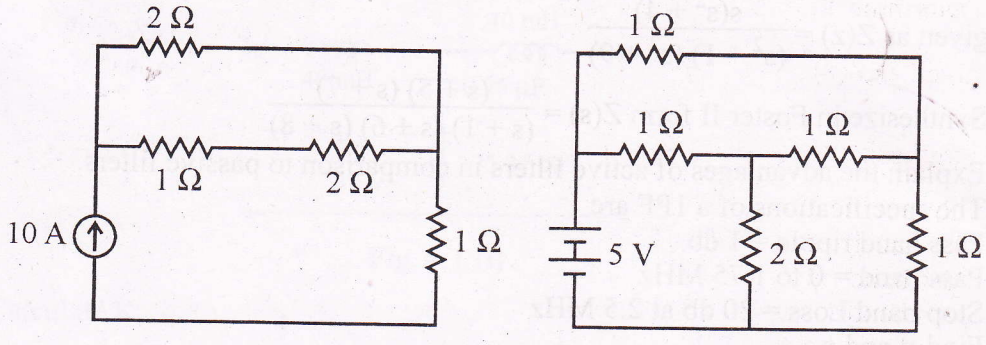

Fig. – 4 (b)

5. Attempt any **one** of the following :

(a) Write necessary conditions for driving-point function and transfer function.

(b) Show that voltage transfer function of the network shown in the following fig. can be written as

$$\frac{V_2(s)}{V_1(s)} = \frac{b_3s^3 + b_2s^2 + b_1s + b_0}{a_3s^3 + a_2s^2 + a_1s + a_0}$$

where $a_3 = b_3 = R_1R_2R_3C_1C_2C_3$

$a_2 = R_3[R_1C_3(C_1 + C_2) + (R_1 + R_2)C_1C_2] + R_1R_2C_2C_3$

$b_2 = R_3(R_1 + R_2)C_1C_2$

$a_1 = R_3(C_1 + C_2) + R_2C_2 + (C_2 + C_3)R_1$

$b_1 = R_3(C_1 + C_2)$

$a_0 = b_0 = 1$

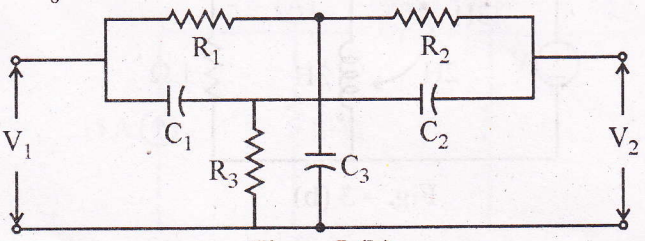

Fig. – 5 (b)

6. Attempt any **two** of the following :

(a) Determine the expression for z-parameters of Lattice network.

(b) Determine the image parameters of the T-network shown below :

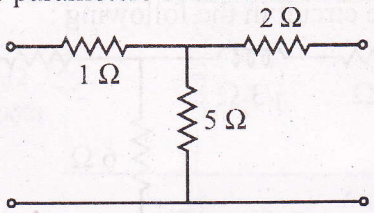

Fig. – 6 (b)

(c) Derive transmission parameters in terms of hybrid parameters.

7. Attempt any **two** of the following :

(a) Given the driving point impedance function of an LC.
Determine the cauer first and second forms of realization for the LC network given as $Z(z) = \frac{s(s^2 + 4)}{(s^2 + 1)(s^2 + 9)}$

(b) Synthesize in Foster II form $Z(s) = \frac{(s + 5)(s + 7)}{(s + 1)(s + 6)(s + 8)}$

(c) Explain the advantages of active filters in comparison to passive filters.
The specifications of a 1PF are
Pass band ripple = 1 db
Pass band = 0 to 1.75 MHz
Stop band Loss = 20 db at 2.5 MHz
Find η and ε.