B.Tech.

Fourth Semester Examination, 2014-15

Network Analysis and Synthesis

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

Note: Attempt all questions. Each questions carry equal marks.

1. Attempt any four parts of the following: 5x4=20

(a) Define the following terms with reference to a linear graph:

(i) Tree

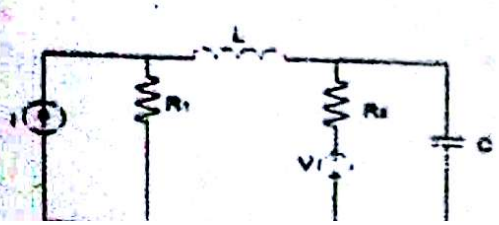
(ii) Link

(iii) Fundamental cut-set and

(iv) Fundamental tie-set

(b) Draw the graph and find possible trees of the circuit shown in fig. 1.

(c) Develop the Tie-set matrix of the circuit shown in Fig. 2. Also find of links.



2. **Attempt any four parts of the following:** **(5x4=20)**

(a) Define initial value theorem and final value theorem. Also find initial and final values of the function

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

(b) Find the driving point impedance function of the network shown in fig.3. Also plot the poles and zeros of Z(s) on s-plane.

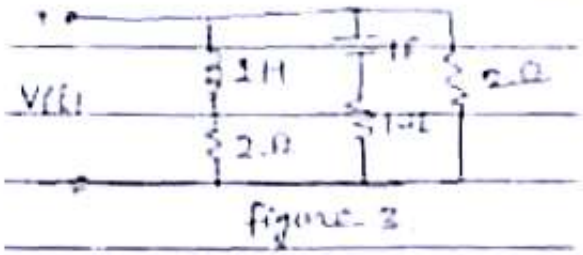


figure-3

(c) If $I(s) = (s^2+5s+9)/(s^3+5s^2+12s+8)$; find i(t).

(d) Using Laplace transformation, solve following differential equation:

$$\frac{d^2i}{dt^2} + 4\frac{di}{dt} + 8i = 8u(t)$$

Given that $i(0^+) = 3$ and $di/dt\ (0^+) = -4$.

(e) State Thevenin's and Norton's theorems and also write their limitations.

(f) State and prove maximum power transfer theorem.

3. **Attempt any two parts of the following:** **(10x2=20)**

(a) Obtain the h-parameters of the two-port network in terms of all other parameters.

(b) Prove that in a parallel interconnected two-networks with admittance matrix $[Y_A]$ and $[Y_B]$ respectively, the overall Y-matrix is given as $[Y] = [Y_A] + [Y_B]$.

(c) What is a positive real function? Also check whether the function $Z(s) = (2s^2+3s+1)/(s^3+3s^2+s+2)$ is positive real function or not.

4. **Attempt any two parts of the following:** **(10x2=20)**

(a) Enlist the properties of R-L admittance function. Check whether the function $Z(s) = [(s^2+1)(s^2+4)]/[s(s^2+2)]$ is R-L network or not.

(b) Realise the following L-C impedance function as (i) Foster–II form, and (ii) Cauer–I form:

$$Z_{LC}(s) = [(s^2+1)(s^2+3)]/[(s(s^2+2)]$$

(c) Find the range of values of 'a' in P(s), so that $P(s)=2s^4+s^3+as^2+s+2$ is Hurwitz.

5. Attempt any two parts of the following: **(10x2=20)**

(a) Synthesize the given function with a 1Ω termination:

$$Z'_{21}(s) = (s^3)/(s^3+3s^2+3s+2)$$

(b) Synthesize the following real–pole transfer function using active R-C circuits:

(i) T(S) = (-3S) / (S+4)

(ii) T(S) = (-2(S+4)) / (S+6)

(c) Explain the following terms:

(i) Frequency Scaling

(ii) Impedance Scaling.