Printed Pages: 6 | 282 | NEC-301

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

Paper ID : 131301 Roll No. | | | | | | | | | | |

B. TECH.

(SEM. III) THEORY EXAMINATION, 2015-16

NETWORK ANALYSIS AND SYNTHESIS

[Time:3 hours] [Total Marks:100]

Section-A

1. Attempt **all** parts. All parts carry equal marks. Write answer of each part in short : (2x10=20)

   (a) Describe the various elements of a network.

   (b) Write the properties of LC driving point function.

   (c) What is positive real function ?

   (d) Write the statement of Thevenin's theorem.

   (e) Write mathematical expression of 'Unit Step' and 'Unit Impulse' signal used in network analysis.

   (f) Define 'Transfer function' of a network.

(g) What do you mean by complex frequency ?

(h) What is Hurwitz Polynomial ?

(i) Explain 'zeros of transmission' in a network.

(j) What do you mean by cut-off frequency of an active filter ?

Section-B

Note: Attempt **any five** questions from this section :

(10x5=50)

2. Prove that in a parallel-parallel interconnected two networks with admittance matrix $[Y_A]$ and $[Y_B]$ respectively. The overall Y-matrix is given by :

$$[Y]=[Y_A]+[Y_B]$$

3. An impedance function is given by :

$$Z(s)=\frac{2(s+1)(s+3)}{(s+2)(s+6)}$$

Find the Foster-I and Cauer-I forms for the network.

4. The network shown in the Fig.1 is a current controlled current source. For this network, find the Y parameters.

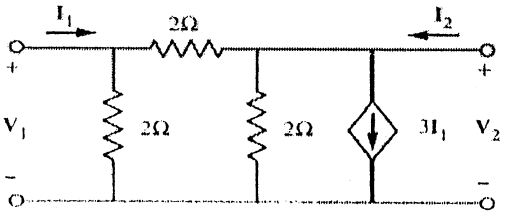

Figure.1

5. In the network shown in Fig.2 $C_1 = C_2 = 1F$ and $R_1 = R_2 = 1\Omega$. The capacitor C_1 is charged to $V_0 = 1V$ and connected across the $R_1 - R_2 - C_2$ network at $t = 0$. C_2 is initially uncharged. Find an expression for $V_2(t)$

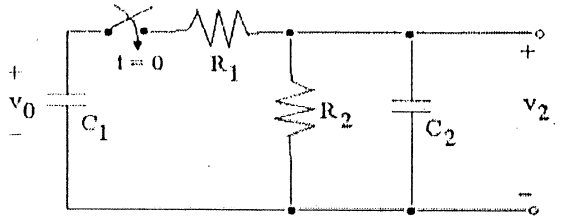

Figure.2

6. Enlist properties of Hurwitz polynomials and positive functions.

7. List properties of transfer function. Determine the circuit elements of the constant resistance bridged-T circuit, shown in Fig.3 that provides the voltage ratio :

$$\frac{V_2(s)}{V_1(s)} = \frac{s^2+1}{s^2+2s+1}, \text{ Assume R} = 1\Omega$$

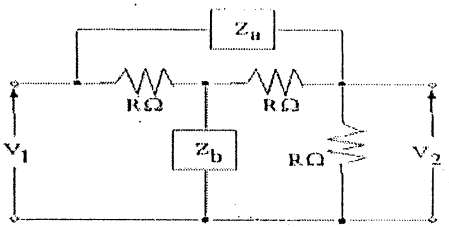

Figure.3

8. Distinguish between Chebyshev approximation and maximally flat approximation as applicable to low pass filters. What is the purpose of magnitude and frequency scaling in low pass filter design ?

9. A third order-Butterworth polynomial approximation is desired for designing a low-pass filter. Determine H(s) and plot its poles. Assume unity d-c gain constant.

Section-C

Attempt **any two** questions from this section.

(15x2=30)

10. The network shown in Fig.4, find $\frac{V_2}{V_1}$ if Za * Zb = R

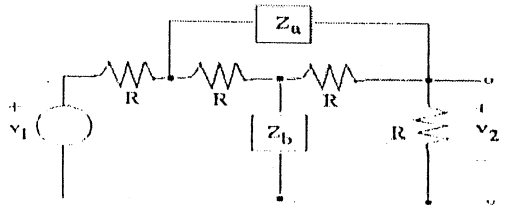

Figure.4

11. Test whether :

(a) The polynomial $F1(s)=s^4 + s^3 + 2s^2 + 3s + 2$ is Hurwitz; and

(b) The function $F(s) = \frac{Ks}{S^2 + a}$ is positive real, where a and K are positive constants.

12. Realize the impedance $z(s)=\frac{2(s^2+1)(s^2+9)}{s(s^2+4)}$ in any three forms of synthesis given below :

(a) Foster-I form

(b) Foster-II form

(c) Cauer-I form

(d) Cauer-II form

—x—