Printed Pages: 6 | 260 | EEC-304

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

Paper ID : 131324 Roll No. | | | | | | | | | | |

B. TECH.

(SEM. III) THEORY EXAMINATION, 2015-16

FUNDAMENTALS OF 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) Define 'initial value' and 'final value' theorem.

   (b) Define reciprocal network.

   (c) List three properties of positive real function.

   (d) Enlist the two important properties to recognize an R-C impedance in synthesis.

   (e) Explain an exponential function.

(f) Write the condition of symmetry in terms of Z, Y, h and T parameters.

(g) Differentiate between active and passive filters.

(h) Show that the described by the transfer function

$$H(S)=\frac{1}{(s^2+0.76536s+1)(s^2+1.84776s+1)}$$ is a Low Pass Filter.

(i) Determine the range of constant 'K' for the polynomial to be Hurwitz

$P(s) = s^3 + 3s^2 + 2s + K$

(j) Write the properties of transfer functions.

Section-B

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

(10 x 5 = 50)

2. Explain the concept of reciprocity and symmetry. Derive the above conditions for h and ABCD parameters.

3. Determine the equivalent Norton Network at the terminals a and b of the circuit shown in figure-1.

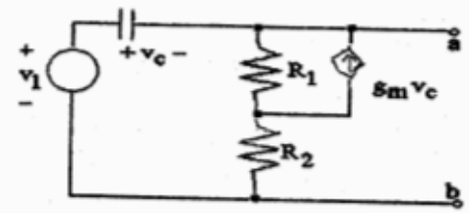

Figure.1

4. The switch K shown in figure-2 is in the steady state in position a for $-\infty < t < 0$. At t = 0, it is connected to position b. Find $i_L(t)$, $t \geq 0$

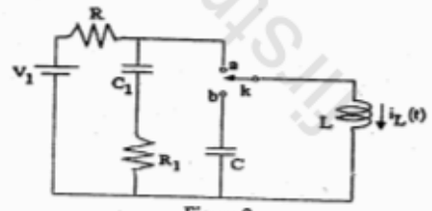

Figure.2

5. Find

(a) The r.m.s. value of the square-wave shown in figure-3.

(b) The average power for the circuit having Zin=1.05-0.67 j Ω when the driving-current is 40-3jA.

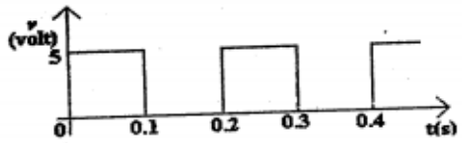

Figure.3

6. Determine whether the function $F(S)=\frac{s^3+2s^2+3s+1}{s^3+s^2+2s+1}$ is positive real or not.

7. Synthesize a ladder network whose driving point impedance function is given by $Z(S)=\frac{2s^5+12s^3+16s}{s^4+4s^2+3}$

8. Synthesize an LC network terminated in 1Ω given that

$$Z_{21}(S)=\frac{2}{s^3+3s^2+4s+2}$$

9. Show that the voltage ratio transfer function of the ladder network shown in figure-4 is given by

$$\frac{V_2(S)}{V_1(S)}=\frac{8s^2}{12s^2+12s+1}$$

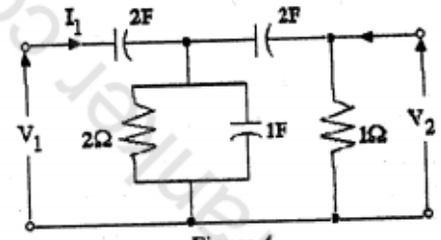

Figure.4

Section-C

Note : Attempt **any two** questions from this section. (15x2=30)

10. Express the impedance Z(s) for the network shown in figure-5 in the form :

$$Z(s) = K\frac{N(s)}{D(s)}$$

Plot its poles and zeros. From the pole-zero plot, what can you infer about the stability of the system ?

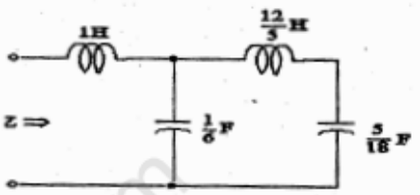

Figure.5

11. Consider the system function $Z(s) = \frac{2(s+1)(s+3)}{(s+2)(s+6)}$.

Synthesize :

(a) An R-L network

(b) An R-C network

12. Find the poles of system functions for low pass filter with n=3 and n=4 Butterworth characteristics. (Do not use the tables)

—x—