

[Total No. of Questions - 9] [Total No. of Printed Pages - 4]
(2063)

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B.Tech 4th Semester Examination

Network Analysis and Synthesis

EC-4004

Time : 3 Hours

Max. Marks : 100

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/ continuation sheet will be issued.

Note : Attempt other four questions, selecting one from each section A, B, C, D. Section E is compulsory.

SECTION - A

1. Find the Laplace transform of

(i) $f(t)=ke^{-at}$ (ii) $f(t) = \sin \omega t$

(iii) $f(t) = e^{-at} t u(t)$ (iv) $f(t)=\sinh (at)$ **(4×5=20)**

2. (a) For the given network function, draw the pole zero diagram and hence obtain the time domain response $I(t)$.

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

(b) Determine the number of roots with positive real parts and negative real parts for the following polynomial equation using Routh criteria:

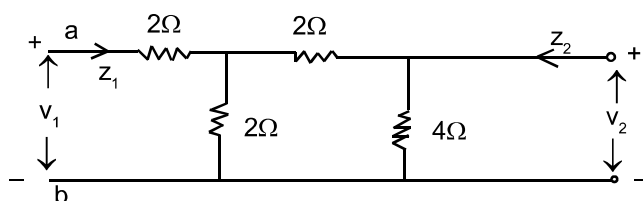
$$Q(s) = s^4 + 2s^3 + 8s^2 + 10s + 15 \quad \mathbf{(20)}$$

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[P.T.O.]

SECTION - B

3. Find out ABCD parameters of the network shown in figure 1. Also find the image parameters for the network.



(20)

Fig. 1

4. A common emitter transistor amplifier can be represented by 4-port network. A signal source of 1mV and resistive load of 10 kΩ is applied at the output of the network. Given $h_{ie} = 2k\Omega$, $h_{fe} = 50$, $h_{oe} = 25 \times 10^{-6}$ mho and $h_{re} = 3 \times 10^{-4}$

Calculate

- (i) h-parameter equivalent circuit
- (ii) Voltage drop across load
- (iii) load current

(20)

SECTION - C

5. Define the following with suitable example.
 (a) Twig (b) Link (c) Fundamental loop matrix (d) Fundamental cut-set matrix (e) incidence matrix. (20)
6. What are important parameters of interest of prototype-k low pass and high pass filter? Explain the impedance of each of these parameters and derive these parameters. (20)

SECTION - D

7. Realize the function $z(s) = \frac{s(s^2 + 4)}{2(s^2 + 1)(s^2 + 9)}$ in both Foster form LC network. **(20)**
8. Test the following polynomial for its Hurwitz character. **(20)**

$$p(s) = s^8 + 3s^7 + 10s^6 + 24s^5 + 35s^4 + 57s^3 + 50s^2 + 36s + 24$$

SECTION - E

9. (a) Find the range of "a" so that $p(s) = s^4 + s^3 + as^2 + 2s + 3$ is Hurwitz.
- (b) Define all the transfer function of two port network.
- (c) What is significance of z-parameter in network analysis?
- (d) In a tank circuit show that the circulating current at resonance is given by $I = \left(\frac{C}{L}\right)^{1/2} \cdot V$ for a supply voltage of V volts (a.c.). Neglect any resistance of the circuit.
- (e) Design a high pass filter (both π & T - network) having cut-off frequency of 2kHz with a load resistance of 300Ω .
- (f) Find the magnitude of the frequency when the drop across the capacitor in series RLC circuit is maximum.

[P.T.O.]

- (g) Z-parameters for a two-port network are given as $Z_{11}=25\Omega$, $Z_{12} = Z_{21} = 20\Omega$, $Z_{22} = 50\Omega$. Find equivalent T network.
- (h) List the properties of positive real function.
- (i) Give the significance of pole in a network.
- (j) Check positive realness of the function.

$$p(s) = \frac{s^2 + 2s + 20}{s + 10}$$

(2×10=20)