[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 9230 **J**

Unique Paper Code : 2513012006

Name of the Paper : Network Synthesis

Name of the Course : **B.Sc. (Hons.) Electronic Science NEP**

Semester : IV

Duration : 3 Hours Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. There are **seven** questions in all, out of which you have to attempt any **five** Questions.
3. **All** questions carry equal marks
4. Question No. **1** is compulsory.
5. Use of simple calculator is allowed.

1. (a) State Initial and Final Value Theorem. (3)

   (b) Define: (3)

   (i) Symmetrical Two Port Network
   (ii) Reciprocal Two Port Network

   (c) Define a Causal System. (3)

   (d) The given impedance function is not an LC- admittance. Give reason. (3)

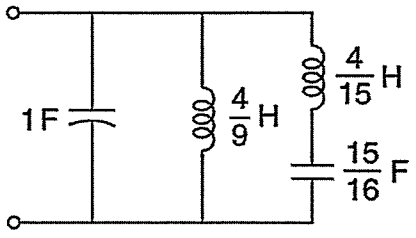
$$Y(s) = \frac{Ks(s^2+4)}{(s^2+1)(s^2+3)}$$

   (e) Determine the number of zeros of transmission for a network with the given transfer admittance. (3)

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

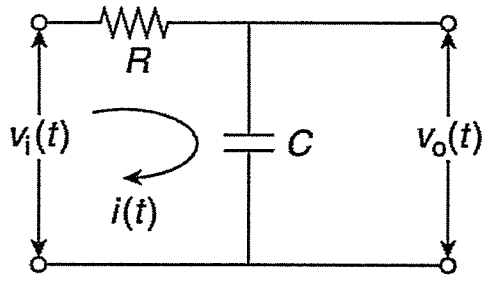
P.T.O.

(f) Find the driving point impedance Z(s) of the given network (3)



2. (a) Derive the transformation expression for an inductor and a capacitor in s domain with initial current I_o and initial charge V_o respectively. Draw the equivalent circuits also. (6)

(b) Determine the voltage transfer function for a RC circuit as shown. Also, find the voltage impulse response of the same. (6)



(c) Deduce the Transmission or ABCD parameters for a two port network. (6)

3. (a) Write the conditions of the system function H(s) that must be satisfied for the network to be stable. (4)

(b) Test if the given polynomials are Hurwitz. (6)

(i) $Q(s) = s^4 + 8s^2 + 32$

(ii) $Q(s) = s^3 + 6s^2 + 12s + 8$

(c) Determine whether the function F(s) is a positive real function (PRF). (8)

$$F(s) = \frac{s^2 + 6s + 5}{s^2 + 9s + 14}$$

Give the significance of PRF.

4. (a) List all the properties of RL impedance functions. (4)

(b) Synthesize the network with the given impedance function using: (14)

(i) Foster form-I and
(ii) Cauer form-II

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

5. (a) Synthesize the given transfer impedance function with a 1 ohm termination. (6)

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

Also, identify the type of filter synthesized.

(b) Derive the equation for a lattice network to be a constant resistance network. (7)

$$Z_a Z_b = R^2$$

(c) Draw the characteristics of an ideal low pass filter. Compare the Butterworth filters with Chebyshev filters. (5)

6. (a) Write the characteristic equation for the given network function. (8)

$$Z(s) = \frac{(2s^2 + 80s + 1000)}{s(s+10)(s+30)}$$

And hence, draw the pole–zero diagram for the same and infer about the stability of the system.

(b) Find the limits of K so that the polynomial $s^3 + 14s^2 + 56s + k$ may be Hurwitz. (4)

(c) Synthesize the network with the given positive real impedance using basic synthesis procedure. (6)

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

7. (a) Differentiate between : (4)

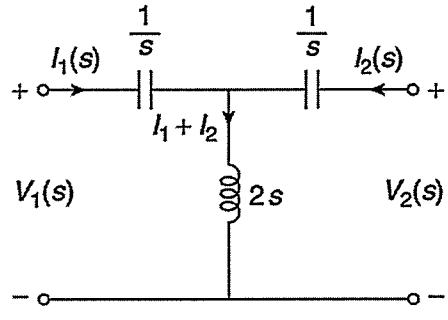
(i) Foster Form-I and Foster Form-II

(ii) Cauer Form-I and Cauer Form- II

(b) Show whether the following driving point functions represent a R-L or a R–C network. Give reasons for your answer. (4)

$$Z(s) = \frac{(s+6)(s+2)}{(s+1)(s+5)}$$

(c) Find the h parameters for the given network. (5)



(d) Determine the following for a two port network terminated by a load resistor R. (5)

(i) Z_{11}

(ii) Z_{21}

(100)