2011

M.Sc.

1st Semester Examination

ELECTRONICS

PAPER—ELC-103

Full Marks : 50

Time : 2 hours

The figures in the right-hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

(Network Analysis and Synthesis)

Answer *Q. No. 1* and any *three* questions from the rest.

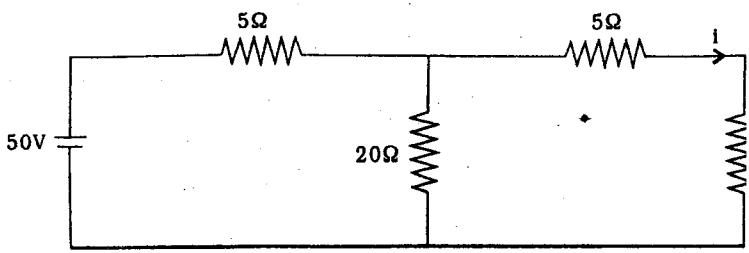
1. Answer all questions : 2×5

a) A network is expressed by the following differential equation :

$$\frac{d^2y}{dt^2} + 2\frac{dy}{dt} + y = \frac{dx}{dt} + 2x$$

Obtain the transfer function, if 'x' is the input and 'y' is the output.

b) Using Thevenin's theorem, find the current 'i' thro the resistor 'R' in the circuit :



c) The impedance of a circuit is given by

$$\vec{Z} = 2 + 3j\ \Omega$$

Find the conductance.

d) Draw the circuit diagram of a symmetrical balanced-bridge T network.

e) Write down the difference between band-pass band-stop filters.

2. a) The reduced incidance matrix of a network is gi below :

Branches →

Nodes ↓

	1	2	3	4	5	6
a	1	−1	0	0	0	0
b	0	1	−1	−1	0	−1
c	0	0	1	1	−1	0
–	–	–	–	–	–	–
d						

Find :

(i) Complete incidence matrix ;

(ii) Without drawing the connected graph the branches in series and also in parallel ;

(iii) Whether the branches (2, 3, 4) will form a tree or not. (1+2+2)

b) For the network as shown in Fig. Q.2(b), find the current through 4Ω resistance using Superposition theorem : 5

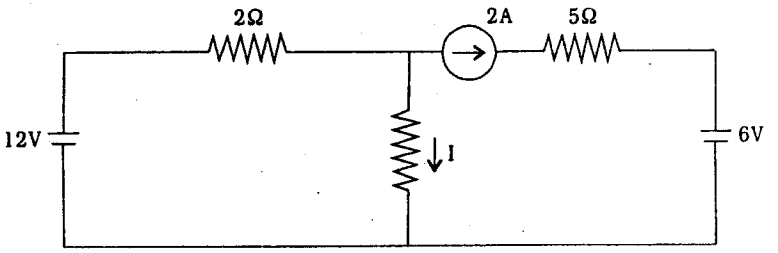


Fig. Q.2(b)

3. a) The following data were obtained experimentally for an unknown two-port network. Obtain the Z-parameters : 5

	V_1	V_2	I_1	I_2
Output open	100V	60V	10A	0
Input open	30V	40V	0	3A

b) The system function of a network is given by

$$H(s) = \frac{S(S+3)}{(S+2)(S^2+6S+25)}.$$

Draw pole-zero diagram.

4. a) What are the properties of positive real functi

b) Test whether the following function is a positive function or not?

$$H(s) = \frac{s^2+20s+4}{s+2}.$$

c) For the circuit as shown in Fig Q.4(c), find I, I_1 I_2 in phasor form. Draw phasor diagram sho V, I, I_1 and I_2 :

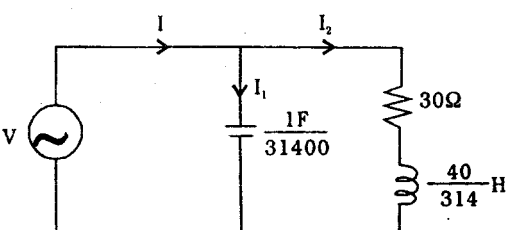


Fig. Q.4(c)

Given : V = 200 sin 314t

5. a) The driving point impedance of a R–C circuit is given by :

$$Z(S) = \frac{S(S^2 + 2S + 1)}{(S+1)(S+2)}$$

Obtain the Foster form of the network. 5

b) Obtain the Cauer form of the network if the driving Point impedance of LC network is given by :

$$Z(S) = \frac{S^2 + 8S + 5}{S(S+4)}$$ 5

6. a) CE transistor equivalent circuit is shown in Fig. Q. 6(a). Find the h-parameters :

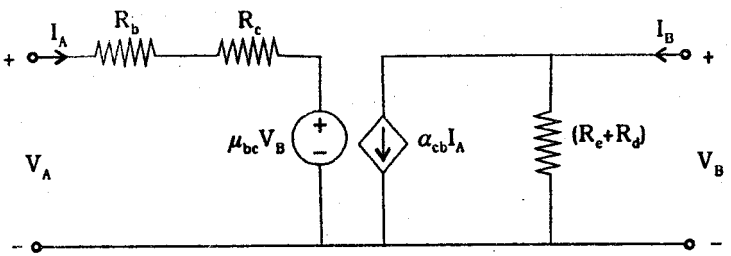


Fig. Q.6(a)

b) A simple R–C low pass filter is to be design so tha the output voltage be attenuated by 3 dB at 50 Hz Calculate the time constant and suitable values of F and C.

Take : R = 10 KΩ

c) What is Bode Plot? 4+4+2

Internal Assessment — 10