M.Sc. 1st Semester Examination, 2010

ELECTRONICS

(Network Analysis & Synthesis)

PAPER—ELC- 103

Full Marks : 50

Time : 2 hours

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

The figures in the right-hand margin indicate marks

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

Illustrate the answers wherever necessary

1. Answer *all* questions : 2 x 5

(*a*) Write the testing procedure of positive real function.

(*b*) What do you mean by characteristic impedance of a network ?

(*c*) A network is expressed by following differential equation :

$$\frac{5\,d^2y}{dt^2} + \frac{3\,dy}{dt} + 2y = \frac{2\,dx}{dt} + x$$

where, '*X*' is input and '*Y*' is output obtain the transfer function.

(*d*) What is Bode diagram ?

(*e*) The impedance of a circuit is given by

$$\vec{Z} = 5 + j6\,\Omega$$

Find the conductance of the circuit with its unit.

2. (*a*) The Reduced incidence matrix of a network is given below :

Branches →

Nodes ↑	1	2	3	4	5	6
a	1	0	0	-1	0	-1
b	0	1	0	1	-1	0
c	0	0	1	0	1	1
d						

(*i*) Obtain the complete incidence matrix.

(*ii*) Without drawing the connected graph, find the branches in series and in parallel.

(*b*) Using Thevenin's theorem, determine the current through 10 Ω resistance of the circuit as shown in *Fig* 1.

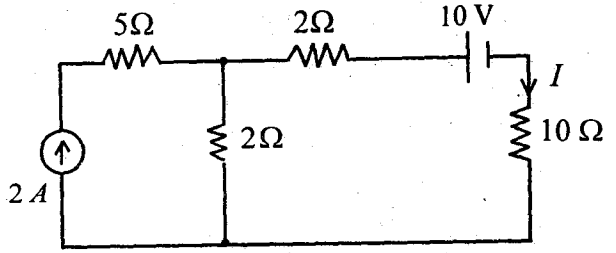

Fig. 1

$(2 + 1\frac{1}{2} + 1\frac{1}{2}) + 5$

3. (*a*) The following readings were obtained experimentally for an unknown two-port network. Determine the *Y*-parameters.

	I_1	I_2	V_1	V_2
Output shorted	5 mA	0·3 mA	25 V	0
Input shorted	5 mA	10 mA	0	30 V

(*b*) The system function of a network is given :

$$H(S) = \frac{S(S+2)}{(S+1)(S^2+4S+13)}$$

Draw Pole-zero diagram.

4. (*a*) For the network as shown in *Fig*. 2, find I, I_C in phasor form. Also draw phasor diagr Given :

$$V(t) = 220\sqrt{2} \sin 31$$

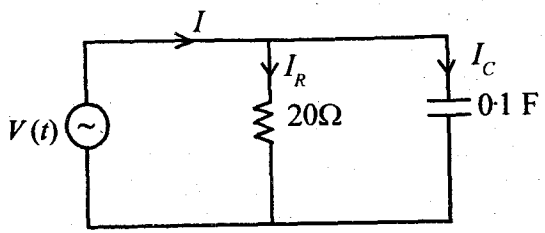

Fig. 2

(*b*) State the conditions for which a system funct $H(S)$ is said to be positive real function.

(*c*) The system function of a network is given l

$$H(S) = \frac{S^2+10S+4}{S+2}$$

Test whether it is a positive real func or not. 5

5. (*a*) Find the 3dB bandwidth of the circuit of *Fig*.3.

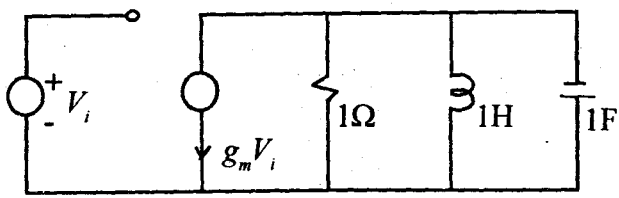

Fig. 3

(*b*) Perform continued fraction expansion of

$$Y(S) = \frac{S^3+2S^2+3S+1}{S^3+S^2+2S+1}.$$

and draw the network. 5 + 5

6. (*a*) The driving point impedance of an LC network is given by

$$Z(S) = \frac{4S(S^2+4)}{(S^2+1)(S^2+16)}.$$

obtain Foster form of network.

(*b*) The driving point impedance of a R – C network is given by

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

obtain Caver form of network. 5 + 5

[*Internal Assessment* : 10 Marks]
