PG/IS/EL-1103/09

M.Sc 1st Semester Examination, 2009

ELECTRONICS

(Network Analysis & Synthesis)

PAPER—EL-1103

Full Marks : 50

Time : 2 hours

Answer **Q. No. 1** and any **three** questions 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 : 2×5

(*a*) State superposition theorem.

(*b*) Distinguish between 'Band-pass' and Band-stop filters.

(*c*) Draw the circuit for the symmetrical lattice section.

(*d*) What do you mean by a characteristics impedance of a network ?

(*e*) What are the conditions for a polynomial to be called as Hurwitz ?

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

Branches →

Nodes ↑	1	2	3	4	5	6
a	1	0	0	−1	0	0
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 the 5Ω resistance of the circuit as shown in *Fig* 1.

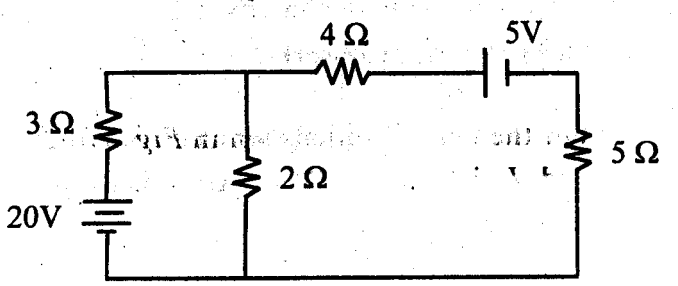

Fig. 1

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

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

	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 as

$$H(s) = \frac{s(s+2)}{(s+1)(s^2+4s+5)}$$

Draw Pole-zero diagram. 5 + 5

4. (*a*) For the network as shown in *Fig.*2 find I, I_R and I_L in phasor form. Also draw phasor diagram.

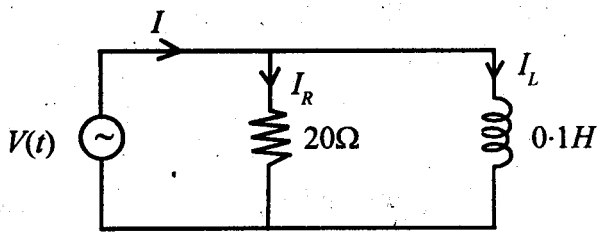

Fig. 2

Given : $V(t) = 220\sqrt{2}\sin 314t$

(*b*) Draw the Pole-Zero diagram of the system function given by

$$Z(s) = \frac{S(S+5)}{(S+2)(S^2+4S+13)}$$

(1 + 1 + 1 + 2) + 5

5. (*a*) A system has system function

given by $H(s) = \dfrac{10(S+2)}{(S+1)(S+3)} = \dfrac{Y(s)}{X(s)}$

Given : $x(t) = 2\cos t$

Determine $y(t)$ using Laplace transform.

(*b*) A band-pass filter consists of two *R-C* networks connected in cascade. The low-pass filter consists of resistance $R_1 = 10\text{k}\Omega$, and capacitor $C_1 = 1\text{pF}$, and high-pass filter consists of $R_2 = 1\text{M}\Omega$ and $C_2 = 0{\cdot}01\ \mu\text{F}$. Find the lower and upper cut-off frequencies and band-pass gain. 5 + 5

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

$$Z(s) = \frac{10(S^2+4)(S^2+16)}{S(S^2+9)}$$

obtain Foster form of network.

(*b*) What is Bode plot ?

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

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

Test whether it is a positive real function or not.

5 + 2 + 3

[*Internal Assessment* : 10 Marks]