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Printed Pages – 8 **TEE – 303**

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2044 **Roll No.**

B.Tech.

THIRD SEMESTER EXAMINATION, 2005-2006

IRD

NETWORK ANALYSIS AND SYNTHESIS

Time : 3 Hours *Total Marks : 100*

Note : *(i) Answer **ALL** questions.*

(ii) All questions carry equal marks.

(iii) Be precise in your answer.

1. Attempt ***any three*** of the following questions :

(a) Define the terms 'tree', 'fundamental loops' and 'fundamental cut-set' related to a linear graph and discuss their properties. **(3+4)**

The fundamental cut-set matrix is given as

f : cutsets	Twigs			Links		
	a	c	e	b	d	f
2	1	0	0	1	0	1
4	0	1	0	0	1	1
5	0	0	1	1	1	1

Draw the oriented graph of the network

(b) What do you understand by the term 'Duality'? Discuss the procedure to find out the dual of a given network having both voltage and current sources. **(7)**

Draw the dual of the network shown in fig.(1) (b)

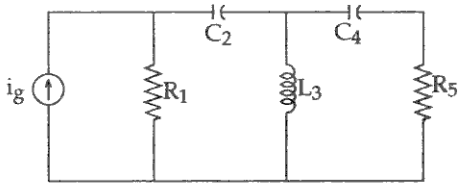

Fig.1(b)

(c) Determine the necessary volues of v and i in the network shown in figure 1 (c). **(6)**

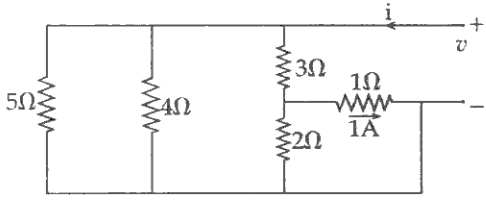

Fig.1(c)

(d) For the circuit shown in figure 1(d) Find the voltage across 4Ω resistor by using nodal analysis **(7)**

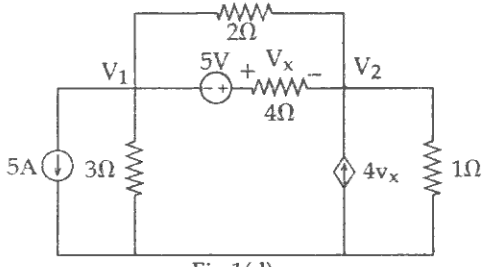

Fig.1(d)

(e) Draw the graph of the network shown in fig.1(e). Find the number of possible trees and draw them. (7)

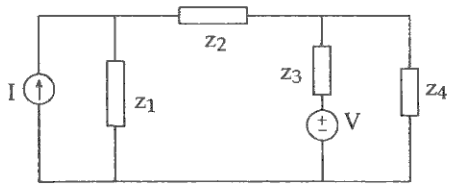

Fig.1(e)

2. Attempt *any three* of the following questions :

(a) Define the term linearity and state the superposition theorem. (7)

Using Thevenin's theorem and superportion theorem convert the active network shown in figure 2 (a) by a single voltage source in series with equivalant impedance and hence find the current '*i*' when A-B is short circuited.

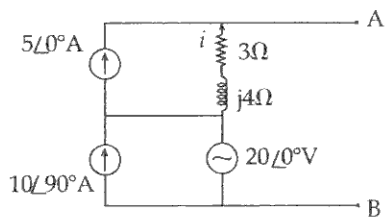

Fig. 2(a)

(b) For the circuit shown in fig 2(b) find the value of Z that will receive maximum power. Also determine this power. (7)

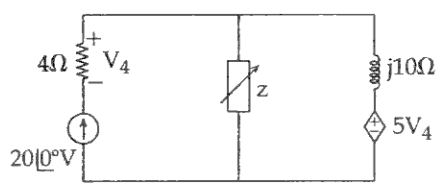

Fig.2(b)

(c) State and explain 'Reciprocity theorem'. Verify the reciprocity theorem for the network shown in figure 2(c) in which voltage soure of 5V causes a current I in the 2Ω resistor. Find the value of I. (7)

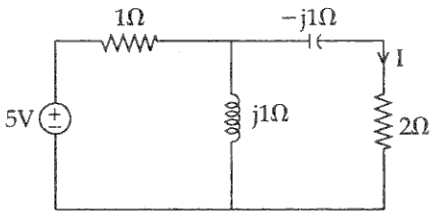

Fig.2(c)

(d) In the network of figure 2(d), verity the substitution theorem by replacing the 6Ω resistor by a voltage source (6)

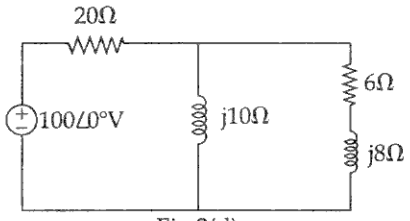

Fig.2(d)

(e) State and prove the dual of 'Millman's Theorem'. Using the millman's theorem find the current 'I' through $R_4 = 5\Omega$ in the network shown in figure 2(e). (6)

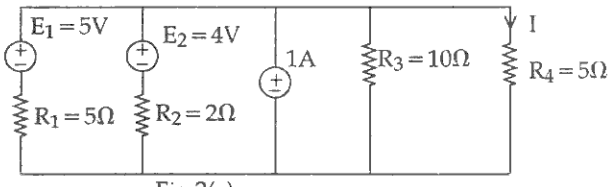

Fig.2(e)

3. Attempt *any two* of the following questions : **(10x2=20)**

(a) Discuss the concept of complex frequency. Giving the possible reasous justify your statement whether following network functions represent driving point immittance function :

(i) $$F(s)=\frac{s^4+s^2}{s^4+s^3+4s^2+5s+6}$$

(ii) $$F(s)=\frac{4s^3+s^2+3s+1}{s^3+2s^2+2s+40}$$

(b) For the ladder network shown in fig 3(b), Find

(i) driving point input impedance Z_{11},

(ii) transfer impedance function $\left(\frac{V_2}{I_1}\right)$ and

(iii) Voltage transfer function $\left(\frac{V_2}{V_1}\right)$. Assume $I_2=0$

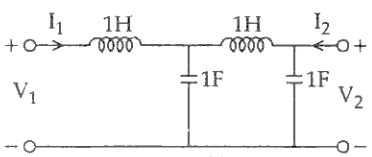

Fig.3(b)

(c) The output voltage V(s) of a network is given by

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

Plot its pole-zero diagram and hence obtain $v(t)$.

4. Attempt *any two* of the following questions : (10x2=20)

(a) Obtain the y-parameters of the circuit shown in fig. 4(a). Find its equivalent circuit using y-parameters and find whether the network is (i) reciprocal (ii) symmetrical.

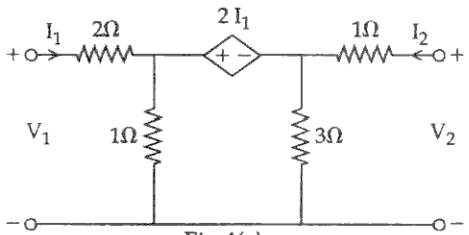

Fig.4(a)

(b) (i) For a two-port network to be reciprocal prove that

$$AD - BC = 1$$

where A,B,C,D are the network's transmission parameters.

(ii) For the circuit shown in figure 4 (b), find z-parameters hence calculate the transmission parameters.

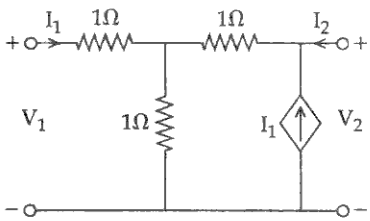

Fig.4(b)

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(c) Find the short circuit and open circuit impedances of the network shown in fig. 4(c) and hence obtain its π equivalent.

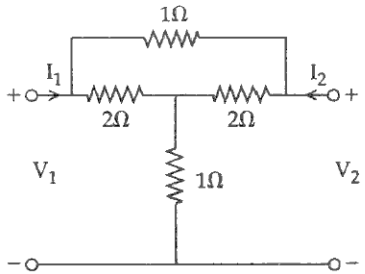

Fig.4(c)

5. Attempt ***any three*** of the following questions :

(a) Derive the expressions for 'Image parameters' of a two-port network in terms of A,B,C,D parameters. **(6)**

(b) Discuss the disadvantages of K-type filters. How these can be overcome using n-derived section ? **(7)**

Design m-derived T-section of a high pass filter having design impedance of 600 ohms, cut-off frequency of 5KHz and m = 0.35. Find also the frequency of infinite attenuation.

(c) Write the conditions for a driving point function to be positive real. **(6)**

Determine whether the function

$$Z(s) = \frac{2s^2 + 5.}{s(s^2 + 4)}$$ is positive real or not.

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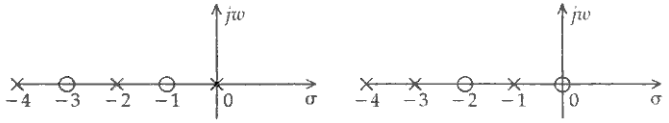
(d) Of the two pole-zero diagrams shown in figure 5 (d), pick the diagram that represents an RL impedance funtion and synthesize by First foster form. (7)



(e) Realize $Z(s)=\frac{s(s^2+2)(s^2+4)}{(s^4+1)(s^2+3)(s^2+5)}$

In First caner form. (7)

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