Ex/BESUS/EE-504/07

B.E. (EE) Part-III 5th Semester Examination, 2007

Network Theory

(EE-504)

Time : 3 hours **Full Marks : 100**

Use separate answerscript for each half.
Answer SIX questions, taking THREE from each half.
Two marks are reserved for neatness in each half.

FIRST HALF

1. a) In the network shown in Fig.-1, N is a two port network. Find V_1 and V_2.

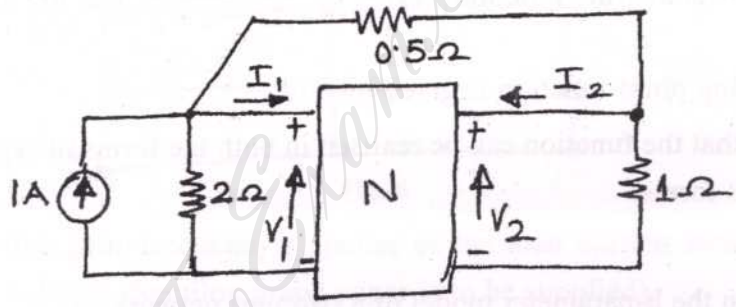

Fig.-1

b) In Fig.-2 a RC network has been shown. Determine its ABCD parameters in Laplace domain. [8+8]

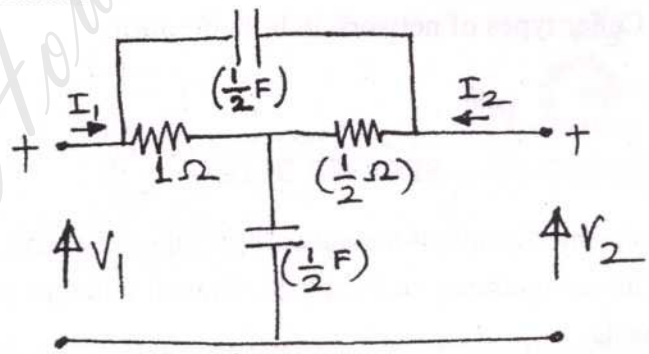

Fig.-2

2. a) Show that the overall ABCD parameters network matrix for a cascaded two port network is the matrix product of ABCD matrices of individual network.

b) Explain briefly the concept of a ladder network. What is its utility?

c) What are the types of negative converter? How would you model a negative converter for circuit analysis? [4+4+8]

3. a) Which of the following networks shown in Fig.-3(a) and 3(b) does not have Z parameters? Why?

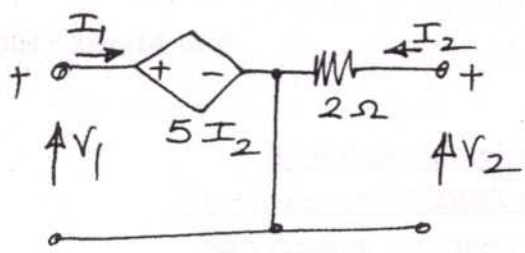

Fig.-3(a)

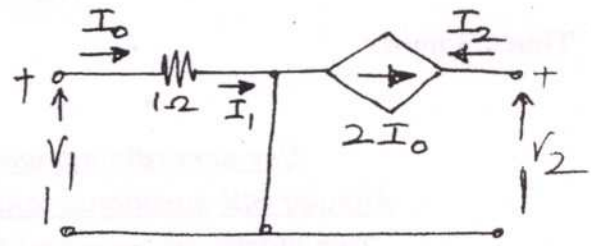

Fig.-3(b)

b) Check whether the polynomial P(s) is Hurwitz, when

$$P(s) = 4s^6 + 2s^5 + 17s^4 + 8s^3 + 16s^2 + 6s + 3$$ [8+8]

4. a) Check whether the function $Z(s) = \dfrac{2s^2 + 2s + 1}{s^3 + 2s^2 + s + 2}$ is a PR function.

b) A driving point function is given by $F(s) = \dfrac{s^2 + 6s + 8}{s^2 + 4s + 3}$.

Show that the function can be realised in both the forms of type-1 Cauer RC and RL forms. [6+10]

5. a) Explain the h-parameter model of a two port network.

b) The driving point impedance of a reactive network is given by

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

Develop Cauer types of network in both the forms. [8+8]

SECOND HALF

6. a) Draw the oriented graph of the network of Fig.-4. Select a tree, from the Tie-set and Cut-set matrices. Solve for the branch voltages and branch currents by loop basis.

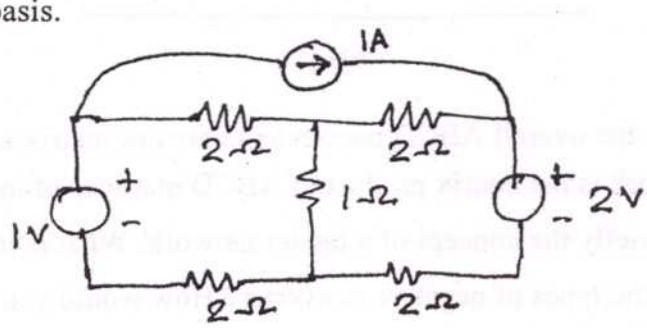

Fig.-4

b) Define the 'Dual' and 'inverse' of a Network. Find the 'Dual' and 'inverse' of the network of Fig.-5. [10+6]

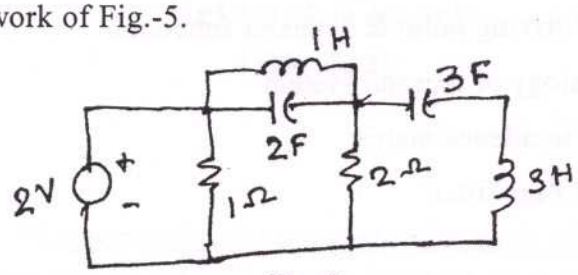

Fig.-5

7. a) Determine the driving point admittance (Y_{11}) and transfer admittance (Y_{21}) for the bridged T-network shown in Fig.-6 with 2Ω load resistor. Show the pole-zero plot of each network function.

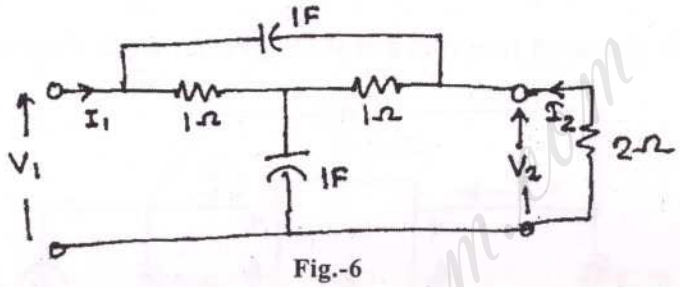

Fig.-6

b) Draw the gain-frequency response of the load current with respect to the input voltage. (Semilog graph paper is to be supplied). [9+7]

8. a) Draw the electrical analogous circuit for the mechanical system shown in Fig.-7 using Force-current and Torque-current analogy.

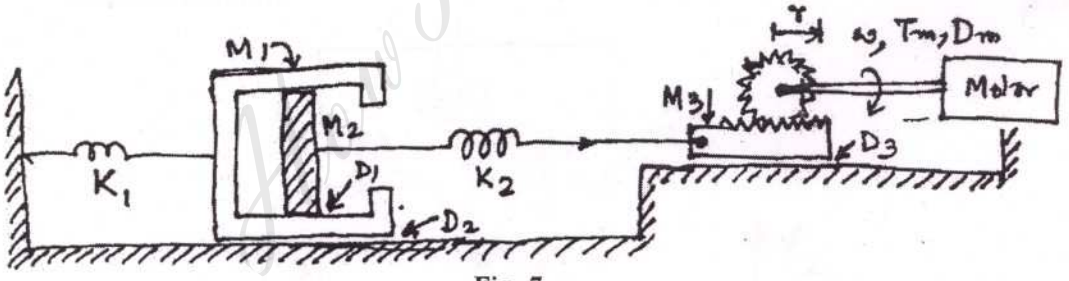

Fig.-7

b) Draw the electrical analogous network for the interactive liquid level system. [12+4]

9. a) With the help of reactance diagrams, show the pass-band and stop-band gains of a prototype ions-pass filter.

b) Design a prototype high-pass π-section filter having lower cut-off frequency of 1 kHz. Compute the filter parameters from fundamental principles. Assume a 600 Ω load for the filter. [8+8]

10. Write short notes on any two : [8×2]

a) Properties of driving point & Transfer functions

b) Electrical analogy of thermal system

c) Properties of incidence matrix

d) Passive Band Pass filter.

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