[Total No. of Questions - 9] [Total No. of Printed Pages - 4]
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16099(D)

= 0 DEC 2016

B. Tech 3rd Semester Examination

Network Analysis and Synthesis (CBS)

EC-303

= 0 DEC 2016

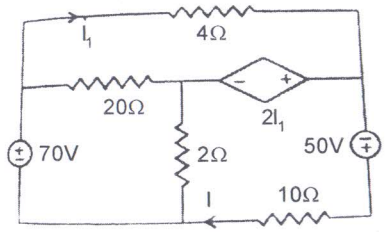
Time : 3 Hours **Max. Marks : 60**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

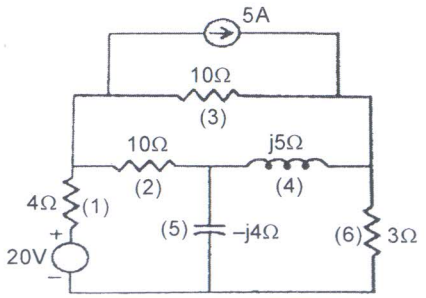
Note : Attempt five questions in all, selecting one question each from section A, B, C & D. Section-E is compulsory.

SECTION - A

1. (a) State and prove with example Maximum Power Transfer Theorem. By superposition theorem calculate I in circuit shown in fig. (5)

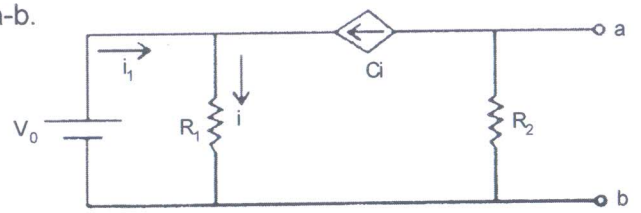


(b) Explain graph and incidence matrix of a network. Also explain networks with mutual inductance. For the network shown in fig., write tie-set matrix and cut-set matrix. Also determine loop currents graphical analysis. (5)



2. (a) Explain Reciprocity theorem and super position theorem. For the circuit shown in figure. The values in figure are V_0 =2V, R_1=2.5 kΩ, R_2=5kΩ, C=100. Find the current i_1. Henceforth find

the Norton equivalent (R TH and I SC) with respect to terminal a-b. (5)



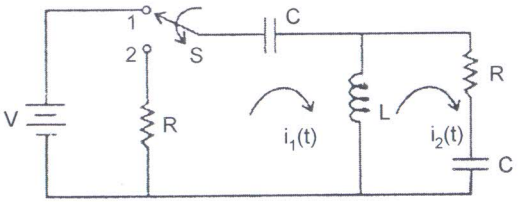
(b) Explain the incidence matrix of a network and networks with duality. Also explain fundamental cutset and tieset matrix. Give examples. (5)

SECTION - B

3. (a) Find the Laplace transform of unit step function, u(t)=1, for t>1 and 0 otherwise and hyperbolic sine function h(t)=sinh(at). Consider a series RL circuit with a switch closed at t=0. Find the current i(t). (5)

(b) Explain the transit response of RL and RLC series combination circuit under sinusoidal excitation. (5)

4. Assume for the figure, that the switch was closed for a long time in position 1 and thrown to position 2 at t=0. Find i_1 (0+) i.e. at t=0+. After the switch has been brought from position 1 to position 2. Find the i_1 (t) and i_2 (t) for t>0. Assume C=1F, L=1H and R=1W. (10)



SECTION - C

5. Explain with example the open circuit impedance parameters for two port networks. Also explain its condition for reciprocity and symmetry.

A two port network shown below is excited by external dc sources. The voltage and current are measured with voltmeters V1, V2 and ammeters A1, A2 (all assumed to be ideal) as indicated. Under the following switch conditions, the readings obtained are:

(i) S1-Open, S2-Closed A1=0A, V1=4.5V, A2=1A, V2=1.5 V

(ii) S1-Closed, S2-Open A1=4 A, V1=6V, A2=0A, V2=6V

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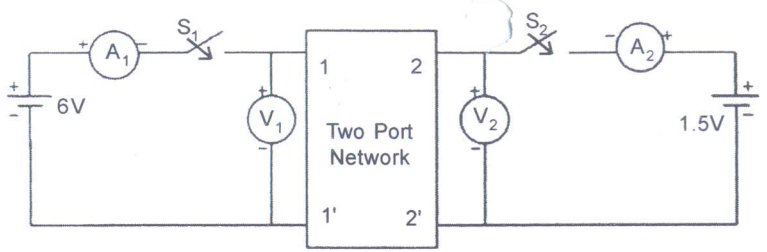


Find the Z-parameter matrix for the network. Henceforth, find the h-parameter matrix for the network. (10)

6. (a) Drive inverse transmission parameters in term of hybrid parameters. (5)

   (b) Explain cascaded connection of two port network with transmission parameter representation. Also explain series-parallel connection with example. (5)

SECTION - D

7. (a) Explain network functions of a two port network. Also explain the necessary condition of a stability of a network function. (5)

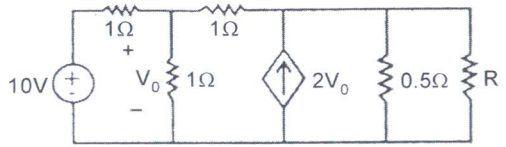
   (b) What do you mean by positive real function? Why a driving point function should be positive real to be realizable? Find the condition of a, b, and c such that the following function is positive real function.
   $F(s)=(s^2+a_1s+a_0)/(s^2+b_1s+b_0)$ (5)

8. (a) Explain the concept of poles and zeros in the network function. (5)

   (b) List the properties of a transfer function. Synthesize the following transfer function in the form of LC network.
   $F(s)=(s^3)/(s^3+3s^2+4s+2)$ (5)

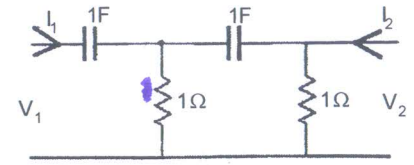
SECTION - E

9. (a) For the circuit below, find the maximum power transferred to the Resistor R.

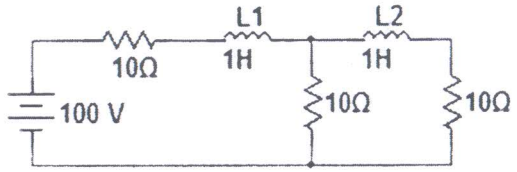


   (b) The time domain behavior of a RL circuit is represented by
   $L(di/dt)+Ri=V_0(1+B\ \exp(-Rt/L)\sin t)u(t)$
   For an initial current of $i(0)=V_0/R$. Find the steady state value of the current.

(c) Find the Z parameter for the network.

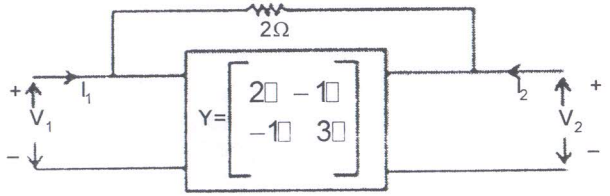


(d) For the circuit shown in fig. Solve the current through inductor L1 and L2. The inductors are initially unenergized. Solve the current through the inductors by Laplace transform

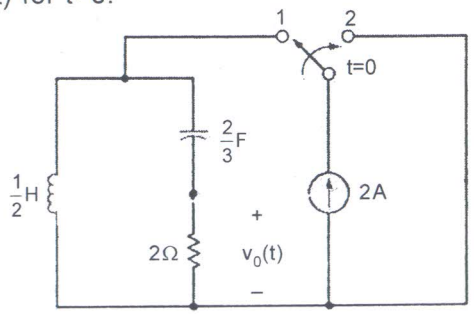


(e) Explain Hurwitz polynomial.

(f) The port network is shown in figure. Find the Y-parameter for the complete network.



(g) The switch moves from position 1 to position 2 at t=0 sec. Find V 0 (t) for t>0.



(h) Find Laplace transform of t.exp(-at).

(i) Prove the condition for reciprocity for hybrid parameters.

(j) What do you mean by isomorphic graphs, explain with example. (2×10=20)