

B. Tech 3rd Semester Examination

Circuit Theory (NS)

EE-212

Time : 3 Hours

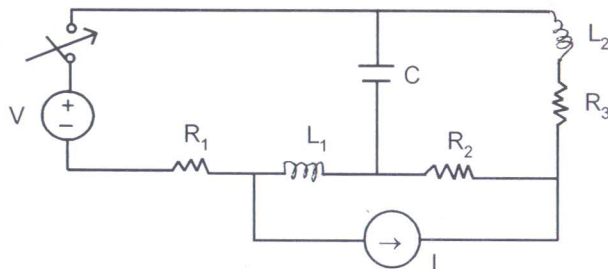
Max. Marks : 100

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

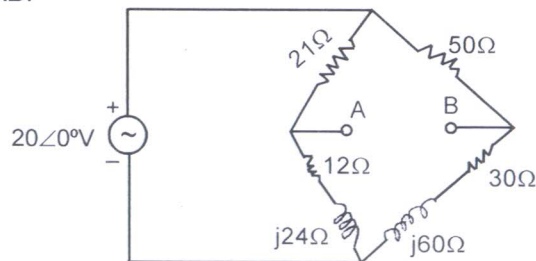
Note : Attempt five questions in all, selecting one question from each sections A, B, C and D. Section E is compulsory.

SECTION - A

- (a) Verify the initial and final value theorem for  $e^{-t}(t^2 + \cos 3t)$ . (10)
- (b) Draw the dual of the network as shown. (10)



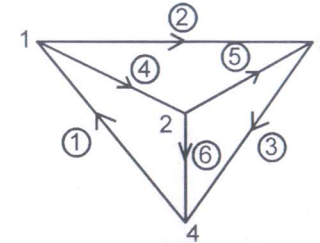
- (a) Obtain Thevenin's equivalent circuit for the network across AB. (10)



- (b) Verify the reciprocity theorem by taking an example. (10)

SECTION - B

- (a) Write the incidence matrix and tie set matrix for the given graph. (10)



- (b) The reduced incidence matrix is given for a graph. Draw the graph and find number of possible trees for this graph. (10)

$$A = \begin{bmatrix} 0 & -1 & 1 & 0 & 0 \\ 0 & 0 & -1 & -1 & -1 \\ -1 & 0 & 0 & 0 & 1 \end{bmatrix}$$

- (a) Discuss the properties of Hurwitz polynomials. (10)
- (b) Test whether the polynomial  $(s^5 + 3s^3 + 2s)$  is Hurwitz or not. (10)

SECTION - C

- (a) For the given network, steady state is reached with the switch closed. The switch is opened at  $t=0$ . Obtain expression for  $i_L(t)$ . (Network given below). (10)
- (b) Find  $V_c(t)$  for  $t>0$ , if the switch is closed at  $t=0$ . (10)

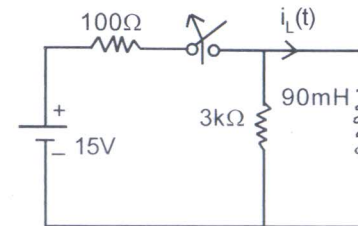


Fig. for Q. 5(a)

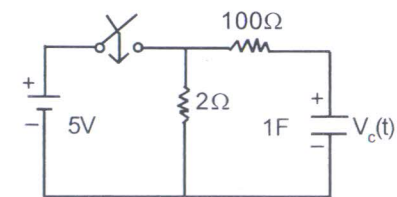
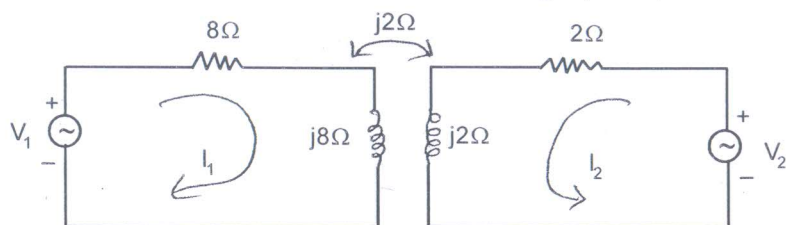


Fig. for Q. 5(b)

[P.T.O.]

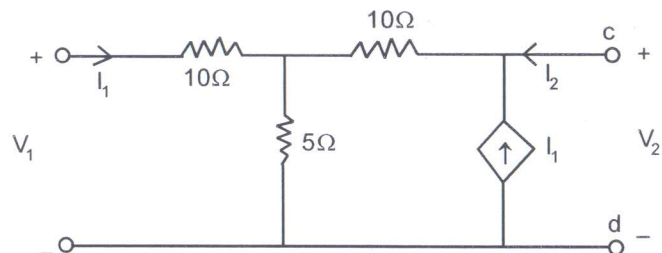
6. (a) For the given circuit determine  $(V_2/V_1)$ , if  $I_1=0$ . (10)



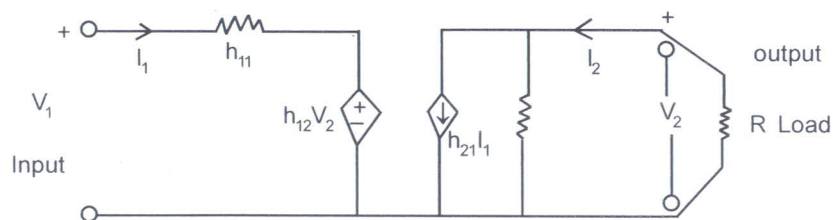
- (b) Two inductors are connected in parallel. Their equivalent inductance, when the mutual inductance aids the self inductance is 6mH and it is 2mH when the mutual inductance opposes the self-inductance. If the ratio of the self inductances is 1:3 and the mutual inductance between the coils is 4mH; find the self inductances. (10)

### SECTION - D

7. (a) Determine z-parameters for the network shown. (10)



- (b) Deduce the condition of reciprocity and symmetry in h-parameter network. (10)
8. (a) For the h-parameter equivalent network, find the voltage gain. Assume the load resistance to be  $R_L$ . (10)



- (b) Express y-parameters in terms of transmission parameters. (10)

### SECTION - E

9. Attempt all.
- (i) Find the final value of the function whose Laplace transform is  $I_s = \frac{s+6}{s(s+3)}$ .
- (ii) Define Q-factor in AC circuit.
- (iii) State compensation theorem.
- (iv) Define initial value theorem.
- (v) In a series RLC circuit  $V_R=3V$ ,  $V_L=14V$ ,  $V_C=10V$ . Find the input voltage to the circuit.
- (vi) In a 3-Q system  $V_{YN}=100 \angle -120^\circ V$  and  $V_{BN}=100 \angle 120^\circ V$ . Then  $V_{YB}$  will \_\_\_\_\_ V.
- (vii) Find the transfer function of a low pass RC network.
- (viii) Express h-parameters in terms of z-parameters.
- (ix) Draw pole-zero plot for the function  $7s/(s+4)$ .
- (x) Mention the conditions for positive realness of a function. (2×10=20)