2019

B.Sc.

1st Semester Examination

ELECTRONICS (Honours)

Paper - C 1-T

(Basic Circuit Theory and Network Analysis)

Full Marks : 40 Time : 2 Hours

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.
Illustrate the answers wherever necessary.

Group - A

1. Answer any *five* of the following : 5×2

   (i) Write down the Kirchoff's Voltage Law and Kirchoff's Current Law. 2

   (ii) State and explain the Thevenin's theorem. 2

   (iii) What do you mean by active and passive circuit elements? Give examples. 2

[Turn Over]

(iv) What do mean by quality factor (Q) of a circuit? 2

(v) What do you mean by true power and apparent power? 2

(v) Define the terms branch, node, mesh and link. 2

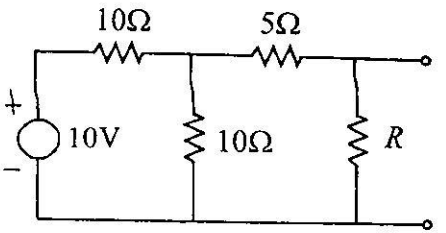
(vii) Write down the conditions of symmetry and condition of reciprocity in a two port network. 2

(viii) Prove that for a Linear resistive network maximum power can be transferred to the load if the source resistance in equal with load resistance. 2

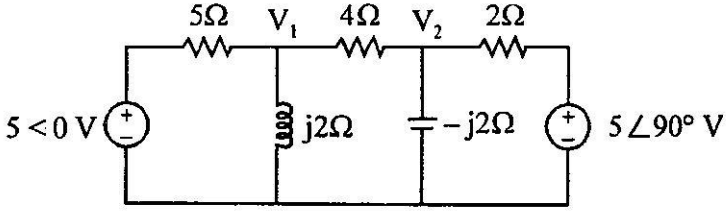
Group - B

2. Answer any *four* of the following : 4×5=20

(i) In the following circuit, calculate resistance R which will allow maximum power dissipation on it. Calculate the maximum power. 5



(ii) Determine the node voltage V_1 and V_2 for the following network. 5



(iii) Draw the oriented graph from the following incidence matrix A_n

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

5

(iv) Prove that for a reciprocal network AD – BC=1 5

(v) Two network N_1 and N_2 are connected in series. The ABCD parameters of network

$$N_1 = \begin{bmatrix} A_1 & B_1 \\ C_1 & D_1 \end{bmatrix}$$

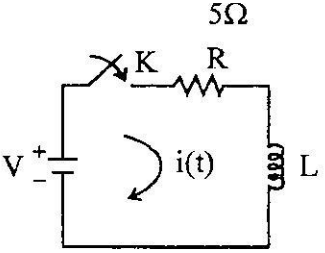
and for network

$$N_2 = \begin{bmatrix} A_2 & B_2 \\ C_2 & D_2 \end{bmatrix}$$

Prove that the ABCD parameter of entire network n is 5

$$\begin{bmatrix} A & B \\ C & D \end{bmatrix} = \begin{bmatrix} A_1 & B_1 \\ C_1 & D_1 \end{bmatrix} \begin{bmatrix} A_2 & B_2 \\ C_2 & D_2 \end{bmatrix}$$

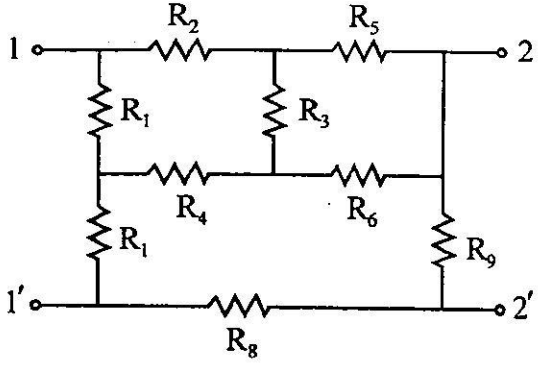
(vi) Determine loop current i(t) for the following R-L network, At t=0, the switch K is closed.



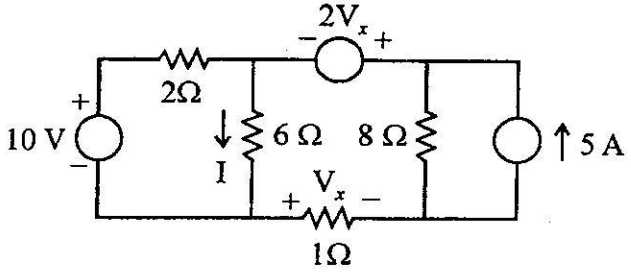
5

3. Answer any *one* question : 1×10

(i) (a) Reduce the following network to an equivalent T network



(b) Use the principle of superposition to find the current I in the following circuit.



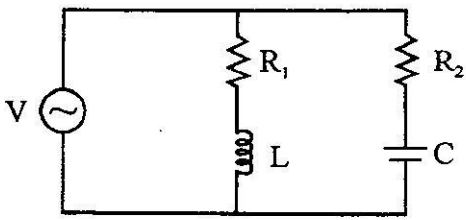
5+5

(ii) (a) Calculate the series and parallel resonant frequencies of a capacitor of 0.005 μF, Inductor of 100 mH and resistance of

250 Ω. Calculate the series and parallel resonant frequencies. Also calculate impedance at series resonance and parallel resonance. 5+5=10

(b) For the following circuit, show that the resonance can not be achieved if

$$R_1^2 + W^2L^2 < 2R_2WL$$



(3+3)+4