Total No. of printed pages = 4

3/1/19

EE 131302

Roll No. of candidate

2019

B.Tech. (EE) 3rd Semester End-Term Examination

CIRCUIT ANALYSIS

(New Regulation)

(w.e.f. 2017-2018)

Full Marks – 70 Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer Q.No. 1 and any *four* from the rest.

1. Answer all the questions : $(10 \times 1 = 10)$

   (i) The no of links of a graph having 8 branches and 6 nodes is ————.

   (ii) Determinant of the incidance matrix of a closed loop is always ————.

   (iii) Condition for Reciprocity in Y parameter is ————.

   (iv) The maximum power that a 10V dc source with an internal resistance of 5 ohm can supply to a resistive load is ————.

   (v) The time constant of a series RC circuit having dc excitation is given by ————.

[Turn over

(vi) A series R-L circuit has R = 20 ohm and L = 5 H. If a dc voltage of 100 V applied at $t = 0$, the time constant is ————.

(vii) A two port network is defined by the relations

$$V_1 = 5I_1 + 3I_2$$
$$V_2 = 2I_1 - 7I_2$$

The value of Z_{22} will be ————.

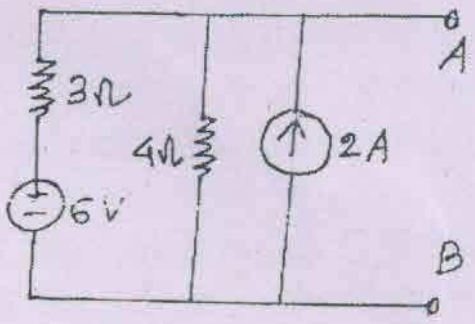
(viii) The polynomial $P(s) = 3S^4 + 5S^3 - S^2 + S + 6$ is a hurwitz polynomial. [True/False)

(ix) The branches that are removed from a tree are termed as ————.

(x) A series R-L circuit having R = 50 ohm and L =10 H are connected across 200V at $t = 0$. The equation of charging current is ————.

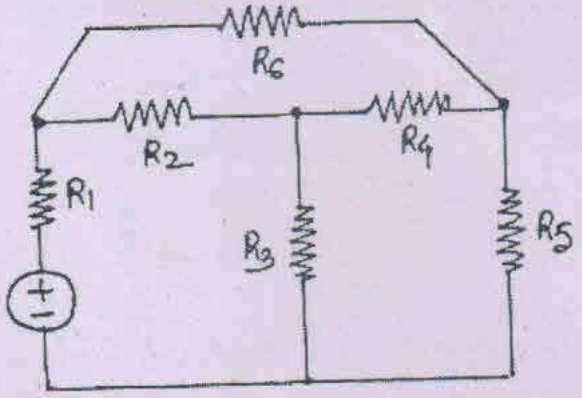
2. (a) Define reduced incidance matrix. What are the properties of incidance matrix? (5)

(b) Find Millmans equivalent for the left of the terminals A-B. (6)

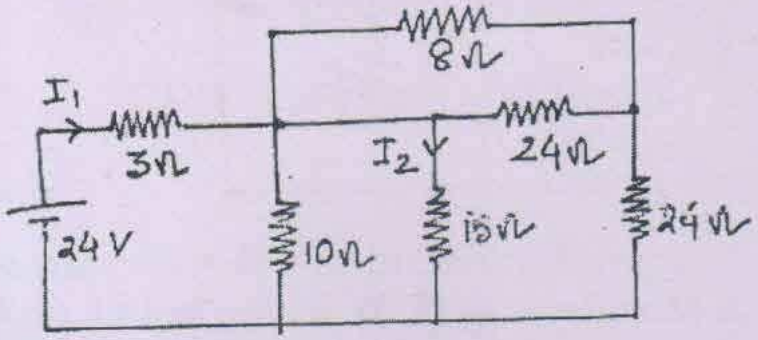


(c) Write short notes on energy stored in an inductor. (4)

3. (a) Find the fundamental Cut-set matrix for the following network. (8)

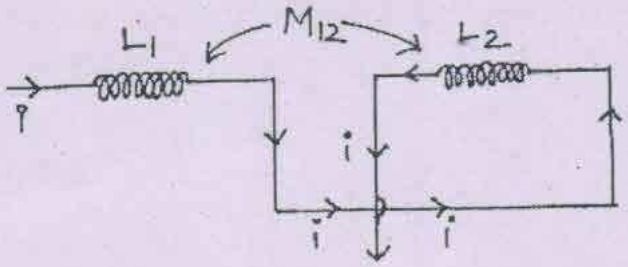


(b) Find I_1 and I_2 of the network using Nodal analysis. (7)



4. (a) State and explain Reciprocity theorem. (5)

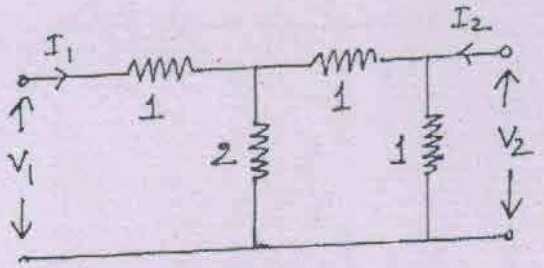
(b) Find equivalent inductance for the following circuit. (5)



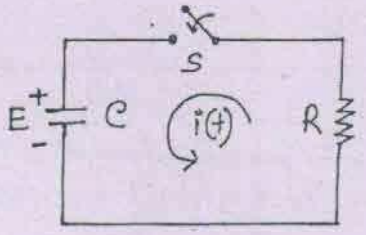
(c) The number of turns in two coupled coils are 500 and 1500 respectively. When a current of 5A flows in coil 1, the total flux in the coil is 0.6 mWb and the flux linking the 2 nd coil is 0.3 mWb? Find L_1, L_2, M and K. (5)

5. (a) Find the equivalent Y parameters if 2 two-port networks are connected in parallel. (8)

(b) Obtain transmission parameters of the network shown in the figure. (7)



6. (a) For the given circuit, find the expression of current $i(t)$. (7)



(b) A series R-L circuit has R = 25 ohm and L= SH. A dc voltage of 100V is applied at $t = 0$. Find

(i) the equation of charging current ($4 \times 2 = 8$)
(ii) voltage across R and L
(iii) the current in the circuit 0.5 Sec later.
(iv) the time at which the drop across R and L are same.

7. (a) A reduced incidance matrix is given by

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

Obtain the number of possible tress. (5)

(b) Find the 1st and 2nd Foster form of the driving point impedance function. (5 + 5 = 10)

$$z(s) = \frac{2(s^2+1)(s^2+9)}{s(s^2+4)}.$$