(viii) Which among the following represents the precise condition of reciprocity of ABCD parameters?
(a) AB - BD = 1   (b)AC-BD=1   (c) BC - AD = 1   (d) AD-BC=1.

(ix) Superposition theorem is not applicable for
(a) current calculation   (b) voltage calculation
(c) power calculation   (d) none of the above.

(x) The Laplace transform of a unit step function is
(a)$\frac{1}{s}$ (b)1   (c)$\frac{1}{s^2}$ (d)$\frac{1}{s+a}$.

Group – B

2. (a) Find the current through 8Ω resistor using mesh analysis for the given network.
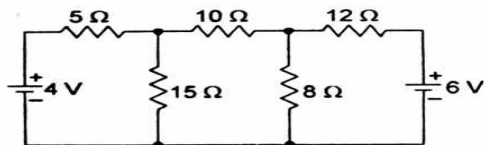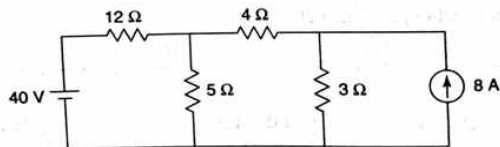

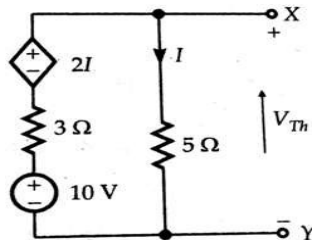(b) Find the current through 10Ω resistor using nodal analysis for the given network
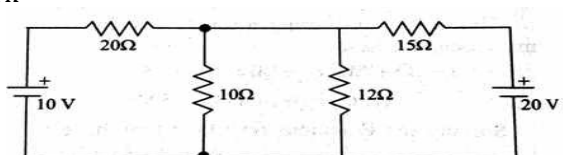
6 + 6 = 12

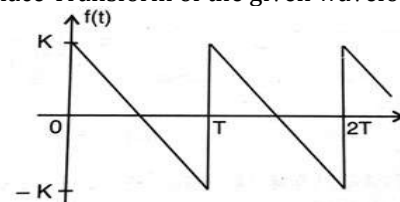3. (a) Find the current through 4Ω resistor using superposition theorem.

(b) Find the Thevenin's Equivalent of the circuit across X-Y terminal for the following circuit.
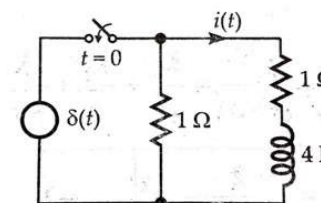

6 + 6 = 12

Group – C

4. (a) Find the Inverse Laplace transform of the following expression $\frac{s+10}{s^2+3s+2}$

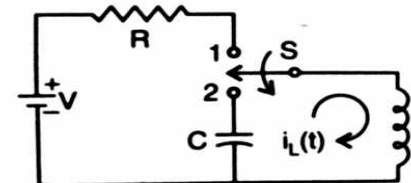(b) Determine the Laplace Transform of the given waveform

6 + 6 = 12

5. (a) Let F(s)=$\frac{5s+3}{s(s+1)}$. Find the initial value f(0+) and final value f(∞).

(b) Find i(t) for the given circuit. Assume zero initial response.

(c) In the circuit the switch is moved from position 1 to position 2 at t = 0 (a steady state existing in position1 before t=0). Find the current through the inductor iL(t).


3 + 4 + 5= 12

Group – D

6. (a) An incidence matrix is given by
$$[A_i]=\begin{bmatrix} 1 & 0 & 0 & 0 & -1 \\ -1 & 1 & 0 & 1 & 0 \\ 0 & -1 & 1 & 0 & 0 \end{bmatrix}$$
Draw the graph corresponding to this matrix.

(b) Show how many trees can be formed from the graph by matrix calculation. Consider any tree from the drawn graph and obtain its tie set matrix.

3 +(3 + 6) = 12

B.TECH/CE/7TH SEM/ELEC 4182/2018
CIRCUIT THEORY ANALYSIS
(ELEC 4182)

Time Allotted : 3 hrs   Full Marks : 70

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and
any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: 10 × 1 = 10

    (i)   Inverse Laplace transform of $\frac{2}{s^2+4}$
            (a) sin2t   (b) sinh2t   (c) cos2t   (d)cosh2t.

    (ii)   How many fundamental tie-sets will be generated for a graph with 'n' number of nodes?
            (a) n+1   (b) n-1   (c) b-n+1   (d) b+n-1.

    (iii)   What will be the value of an element of a complete incidence matrix, if an associated branch is oriented away from the node?
            (a) +1   (b) 0   (c) -1   (d) infinity.

    (iv)   A Two port network has transmission parameters $\begin{vmatrix} A & B \\ C & D \end{vmatrix}$ .The input impedance of the network at port 1 will be
            (a)$\frac{A}{C}$ (b)$\frac{B}{C}$ (c)$\frac{AD}{BC}$ (d)$\frac{AB}{DC}$.

    (v)   Norton's equivalent circuit consists of
            (a) equivalent current source and impedance in series
            (b) equivalent current source and impedance in parallel
            (c) equivalent voltage source and impedance in series
            (d) equivalent voltage source and impedance in parallel.

    (vi)   The cut-set matrix gives the relation between
            (a) branch voltages and branch currents
            (b) branch voltages and twig branch voltages
            (c) branch voltages and link currents
            (d) Iink voltages and link currents.

    (vii)   What is the initial value of the signal with Laplace transform $\frac{1}{s(s+2)}$?
            (a)0   (b)2   (c)infinite   (d)1.

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7. (a) What is the relation between Twigs and Links of a graph? What are the properties of a tree in a graph?

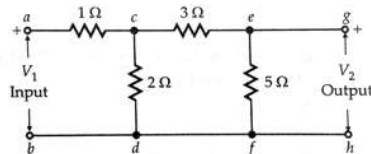   (b) Draw the oriented graph from the given circuit.
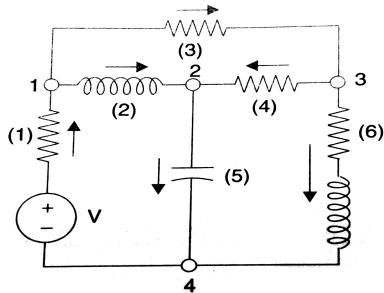
Form the incidence matrix from the graph.

(2 + 3) + (3 + 4) = 12

Group – E

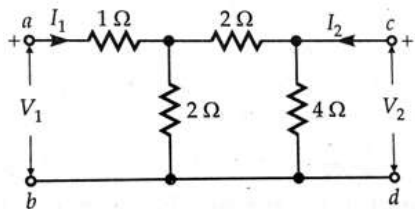8. (a) Find the Z-parameters for the circuit shown.

   (b) Derive the conditions of Reciprocity and Symmetry for impedance (Z) parameters.

6 + (3 + 3) =12

9. (a) How the Impedance parameters can be represented in terms of Y-parameters and ABCD parameters?

   (b) For the given circuit, find out the admittance(Y) parameters.

(3 + 3) + 6 = 12