(vii) Laplace Transform of unit step function is
(a) 1/s   (b) s   (c) 1/(s + 1)   (d) $1/s^2$.

(viii) A two port network is reciprocal if
(a) $Z_{11} = Z_{22}$ (b) $Y_{12} = Y_{21}$ (c) $Y_{12} = Y_{22}$ (d) $Y_{11} = Y_{21}$.

(ix) Short circuit forward transfer admittance is:
(a) Y_{11} (b) Y_{12} (c) Y_{22} (d) Y_{21}.

(x) Mesh analysis is based on
(a) KCL   (b) KVL
(c) KVL and KCL   (d) none of above.

Group – B

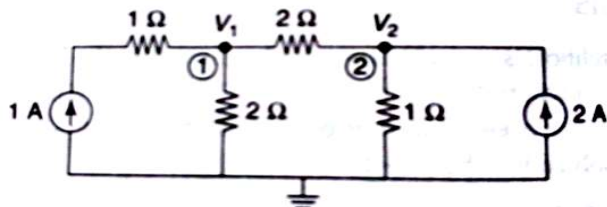2. (a) Find the node voltages at nodes 1 & 2 of Fig.1.

Fig.1

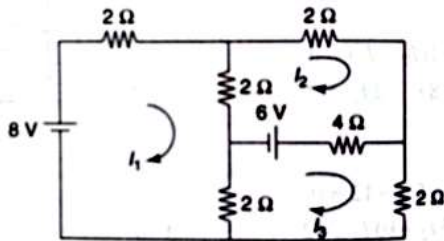(b) Find the current through 4 Ω resistance using mesh analysis of Fig.2.

Fig.2

6 + 6 = 12

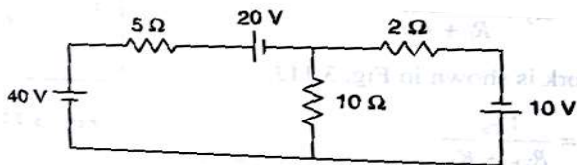3. (a) Obtain current through 2 Ω resistance of Fig.3 using Thevinin's theorem.

Fig.3

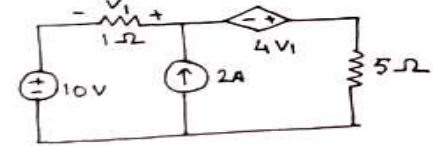(b) Find the current in 5Ω resistor of Fig.4 using Superposition Theor

Fig.4

6 + (

Group – C

4. (a) Define ramp signal and gate signal.

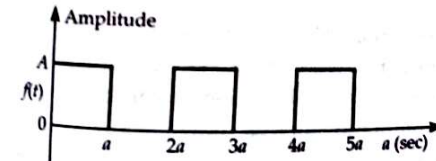(b) Find Laplace Transform of given signal shown in Fig.5.

Fig.5

(c) Find initial value and final value of the following fu
$$F(S) = \frac{5}{S(S+3)(S+8)}$$

3 + 6 + :

5. (a) In the following circuit voltage is 5Volts dc. Obtain Transient cu
i(t) through the circuit of Fig.6. Define time constant of a R-C circu

Fig.6
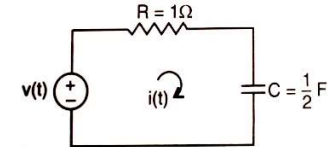
(b) The switch S is in position 1 at a long time and moved to positio
t = 0. Find the current through the inductor $I_L(t)$ of Fig.7.

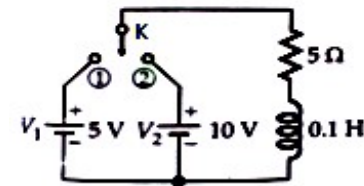*Fig.7* **7 + 5 = 12**

Group – D

6. (a) What is a tree? Write the properties of a tree.

    (b) Explain how many branches are there is a co-tree?

    (c) Consider the following incidence matrix and draw the graph.

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

$$(1 + 3) + 2 + 6 = 12$$

7. (a) Develop complete incidence matrix from the directed graph given in Fig.8.
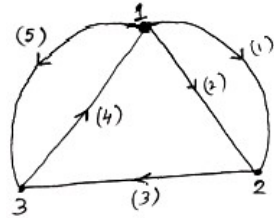

Fig.8

    (b) Select a tree of the above graph and compute tie-set matrix and fundamental cut-set matrix.

$$4 + (4 + 4) = 12$$

Group – E

8. (a) Define Y-parameters.

    (b) Determine the ABCD-parameters for the circuit shown in Fig.9.
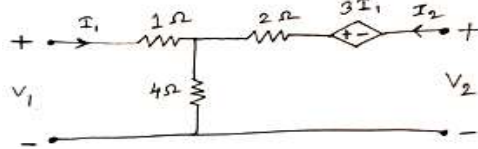

Fig.9

$$3 + 9 = 12$$

9. (a) Find Z parameters in terms of ABCD-parameters.

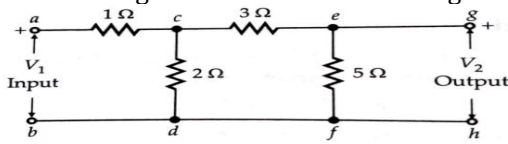   (b) Find Y parameters of the given network shown in Fig.10.

Fig.10

$$4 + 8 = 12$$

CIRCUIT THEORY ANALYSIS
(ELEC 4182)

Time Allotted : 3 hrs   **Full Mark**

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 practic

Group – A
(Multiple Choice Type Questions)

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

    (i) Superposition theorem is valid only for
        (a) linear circuits   (b) non-linear circuit
        (c) both (a) and (b)   (d) none of these.

    (ii) Application of Norton's theorem to a circuit yields
        (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.

    (iii) Time constant of a RC circuit is
        (a) C/R   (b) R/C   (c) RC   (d)

    (iv) Laplace Transfrom analysis gives
        (a) time domain response only
        (b) frequency domain response only
        (c) both (a) and (b)
        (d) neither (a) nor (b).

    (v) Which among the statements given below is/are the prope 'Complete Incidence Matrix'?
        (a) Determinant of a loop of a complete incidence matrix is always z
        (b) Addition of all entries in any column should be equal to zero
        (c) Rank of connected or oriented graph is always 'n-1'
        (d) All of the above.

    (vi) The number of independent loops for a network with n nodes and b branc
        (a) n + 1   (b) n - 1
        (c) b - n + 1   (d) b + n - 1.