Aliah University

Department of Electrical Engineering

B. Tech. III sem. Examination March -2021

Sub: Circuit Theory & Networks **Code- EENUGOE01**

Full Marks: 80 Duration: 3 hrs

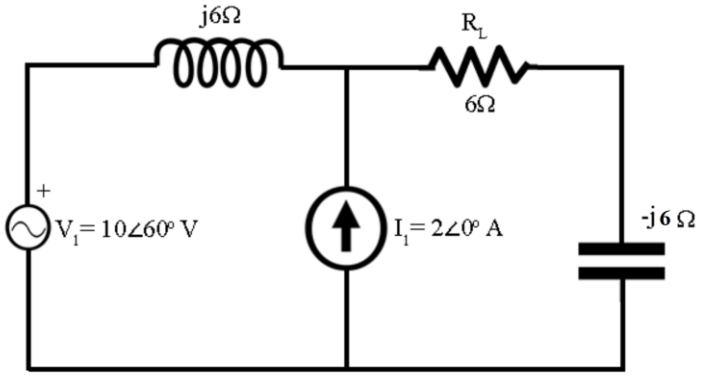
Instruction: 1. Write from your own understanding in your own words; don't simply copy from website/notes/books etc.

2. Avoid mixing-up the answers of different groups.

Group-A

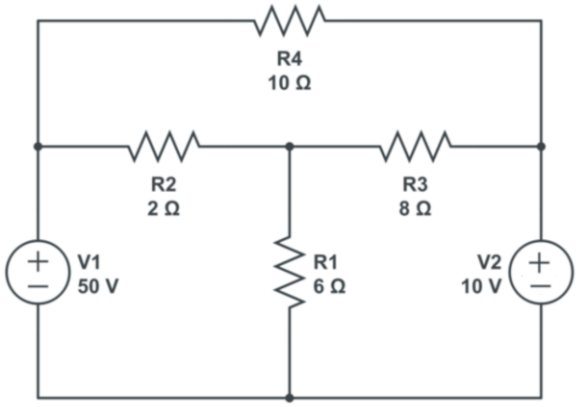
(Answer any five questions: 5 X 8 = 40 Marks)

1. Find the current in the resistor R_L using the principle of superposition in Fig. below. **[8]**



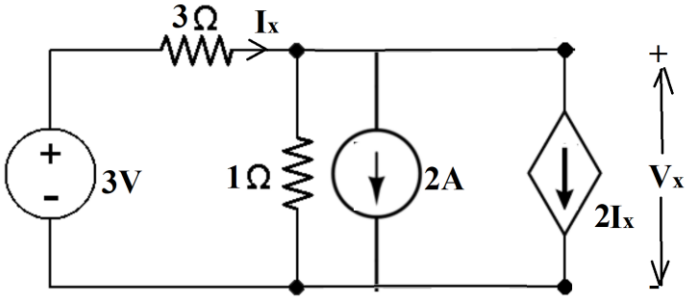
2. (a) Distinguish between unilateral and bilateral circuit elements. **[2]**

(b) Determine current through resistor R_2 using mesh analysis shown in Fig. below. **[6]**



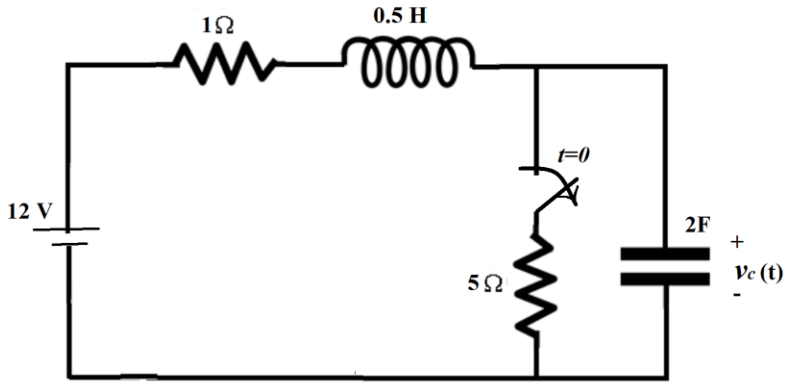
3. (a) State Thevenin's theorem. **[3]**

(b) Find V_x and I_x for the circuit shown in Fig. below. **[5]**



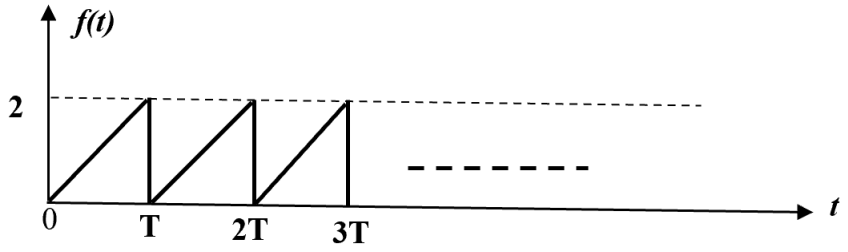
4. (a) Find Laplace transform of $f(t) = e^{-3t}\cos 5t$ **[2]**

(b) Consider the circuit shown in Fig. below. The switch was closed for a very long time and at time t = 0, the switch is opened. Find the expression of $v_c(t)$ for t>0. **[6]**



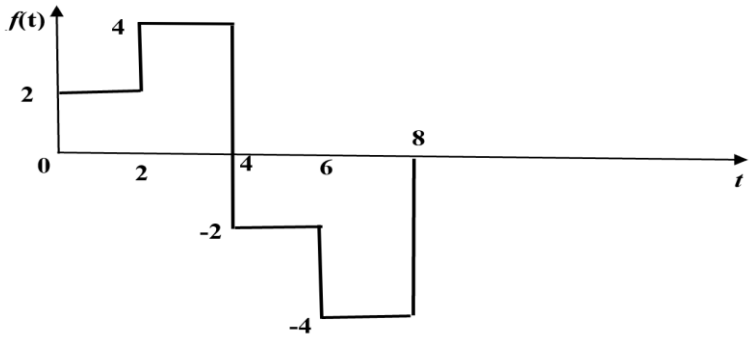
5. (a) Prove that $\lim_{t\to\infty} f(t) = \lim_{s\to 0} sF(s)$. **[3]**

(b) Find the Laplace transform of the signal shown in Fig. below. **[5]**



6. (a) Find inverse Laplace transform of $F(s) = \frac{(s+2)}{(s+1)^2(s+3)}$. **[4]**

(b) Consider the signal shown in Fig. below. Represent the signal in terms of unit step function. **[4]**

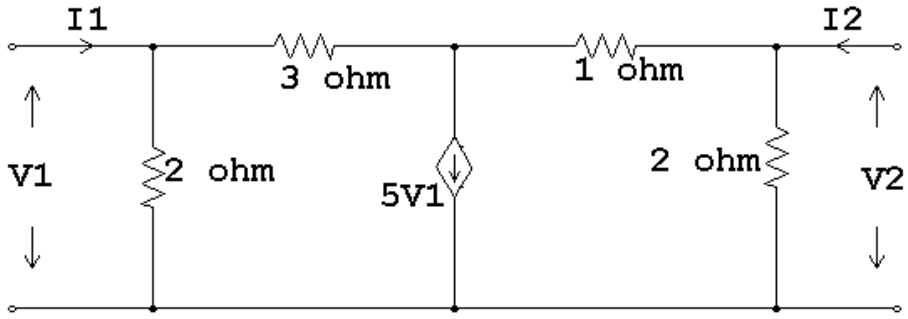


Group-B
(Answer any Five: 5 X 8 = 40 Marks)

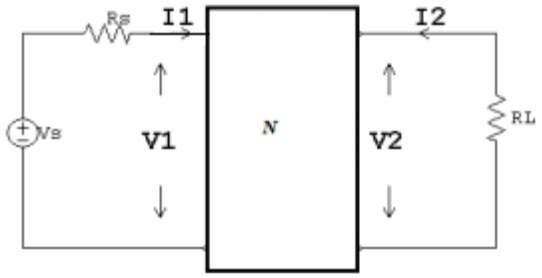
7. (a) Derive the condition for reciprocity and symmetry for T-parameters. **[3]**

(b) Derive h-parameters in terms of Y-parameters and T-parameters in terms of h-parameters. **[5]**

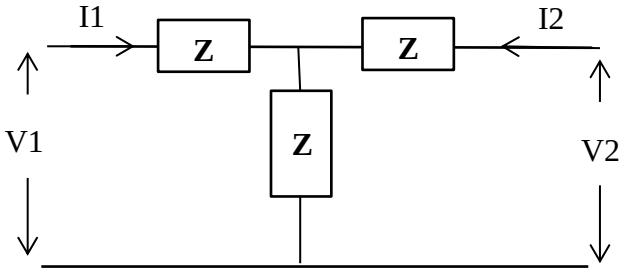
8. Find the open circuit impedance parameters for the given circuit. **[8]**



9. (a) The hybrid parameters of the network 'N' shown in figure are: h11 = 1 Ω, h12 = 1, h21 = -4, h22 = 5 ℧. Determine the supply voltage Vs, if the power dissipated in the load resistor R_L (= 8 Ω) is 30 W and R_S = 2 Ω. **[4]**



(b) Find the transmission parameters for the network: **[4]**



10. A 3-phase, 4-wire system having a 230 V phase voltage has the following loads connected between the respective lines & neutral: $Z_R = 15\angle 30^0$ Ω, $Z_Y = 15\angle 45^0$ Ω, & $Z_B = 15\angle 60^0$ Ω. Calculate the current in the neutral wire and power taken by each load.

11. A symmetrical 3-phase, 420 V system supplies a star-connected load of $Z_R = 8\angle 30^0$ Ω, $Z_Y = 10\angle 45^0$ Ω, & $Z_B = 12\angle 50^0$ Ω. Assuming the neutral of the supply is earthed, calculate the voltage of the star point to earth.

12. Take an arbitrary network of your choice (minimum 4 nodes). Draw its oriented graph and select a tree. From thereon express the following:
(i) Relation between incidence matrix and branch current matrix
(ii) Relation between tie-set matrix and branch voltage matrix.
(iii) Relation among branch currents matrix, fundamental loop currents matrix and tie-set matrix.