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**GAYATRI VIDYA PARISHAD COLLEGE OF ENGINEERING FOR WOMEN**  
(AUTONOMOUS)

(Affiliated to Andhra University, Visakhapatnam)

**I B.Tech. - I Semester Regular Examinations, December / January – 2025**

**Network Theory and Machines**

(Electronics and Communication Engineering)

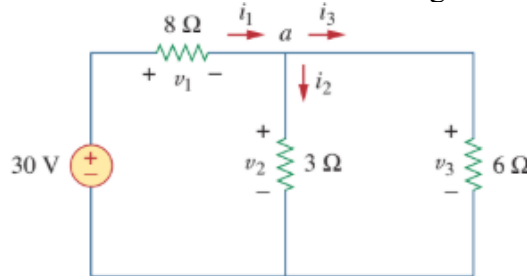
- All questions carry equal marks
- Must answer all parts of the question at one place

**Time: 3Hrs.**

**Max Marks: 70**

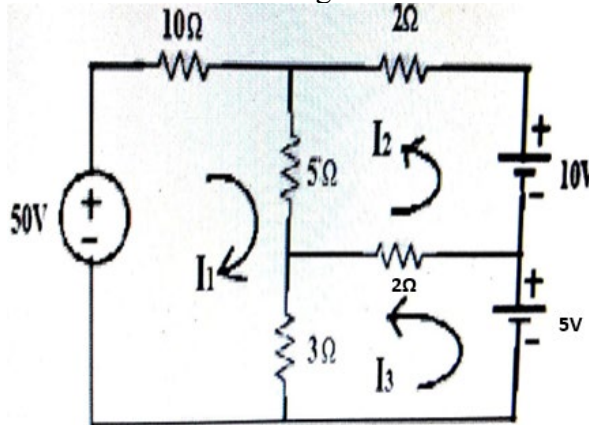
**UNIT-I**

- Explain the source transformation technique and star-delta transformation with an example? [7M]
  - Find currents and voltages in the circuit shown in below Fig. [7M]



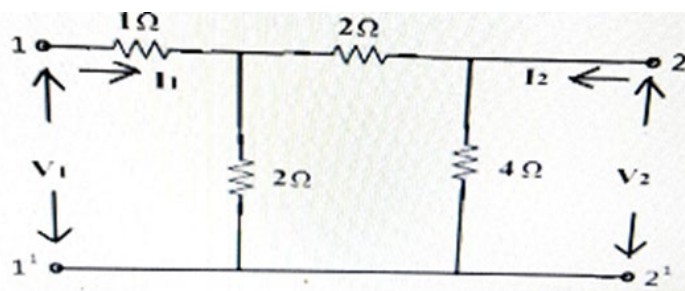
OR

- Explain about Nodal analysis and write the steps for applying nodal analysis. [7M]
  - Determine the mesh currents for the following network. [7M]



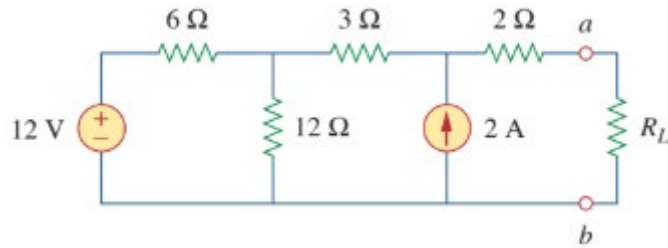
**UNIT-II**

- State and prove Reciprocity theorem. [7M]
  - Find the transmission parameters for the circuit shown in figure. [7M]

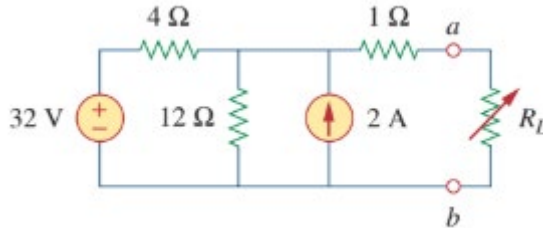


OR

4. a. Find the value of  $R_L$  for maximum power transfer in the circuit of below Fig. Find the maximum power. [7M]



- b. Find the Thevenin equivalent circuit of the circuit shown in Fig., to the left of the terminals a-b. Then find the current through  $R_L = 6$  and  $36 \Omega$ . [7M]



### UNIT-III

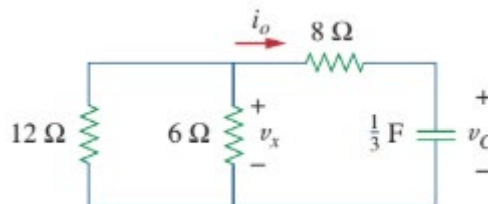
5. a. Explain the concept of power factor and its importance in AC circuits. Derive the expression for power factor in terms of resistance and reactance. [7M]  
 b. A single-phase AC circuit has an impedance of  $20 + j30 \Omega$ . Find the admittance of the circuit and the current flowing through it when connected to a 100 V, 50 Hz, AC source. [7M]

OR

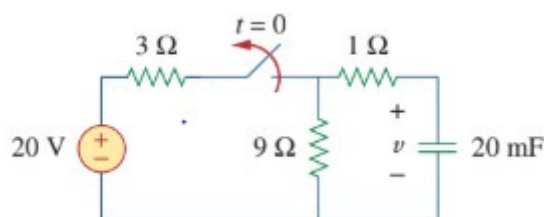
6. a. A series RLC circuit has  $R = 5 \Omega$ ,  $L = 0.05 \text{ H}$ , and  $C = 200 \mu\text{F}$ . The circuit is connected to a variable frequency AC source. Find the resonant frequency, Q-factor, and bandwidth of the circuit. [7M]  
 b. A single-phase AC circuit has a resistance of  $20 \Omega$  and an inductive reactance of  $30 \Omega$ . The circuit is connected to a 200 V, 50 Hz AC source. Draw the phasor diagram and calculate the power factor, apparent power, and active power. [7M]

### UNIT-IV

7. a. For the circuit in below Fig. Let  $V_C(0) = 60\text{V}$ . Determine  $V_C$ ,  $V_x$  and  $i_o$  for  $t \geq 0$ . [7M]

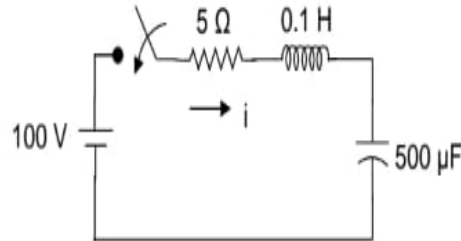


- b. The switch in the circuit in Fig. has been closed for a long time, and it is opened at  $t = 0$ . Find  $v(t)$  for  $t \geq 0$ . Calculate the initial energy stored in the capacitor. [7M]



OR

8. a. A series RC circuit has  $R = 5 \text{ k}\Omega$  and  $C = 10 \text{ }\mu\text{F}$ . The circuit is connected to a 50 V DC source. Find the voltage across the capacitor at  $t = 0$  and  $t = \infty$ . Also, find the time constant of the circuit. [7M]
- b. Taking the initial conditions as zero, find the transient current in the circuit shown in below Fig. when the switch is closed at time  $t = 0$ . [7M]



### UNIT-V

9. a. Explain the methods of speed control of a DC shunt motor. Compare the advantages and disadvantages of each method. [7M]
- b. State the principle of operation of transformer and derive its EMF equation. [7M]
- OR
10. a. Explain the constructional details of DC machine with neat sketch. [7M]
- b. Explain the double field revolving theory of single-phase induction motors. Describe the role of the forward and backward rotating fields in the operation of the motor. [7M]