

Code No: 181AH

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech I Year I Semester Examinations, January/February - 2024

ELECTRICAL CIRCUIT ANALYSIS –I

(Electrical and Electronics Engineering)

Time: 3 Hours

Max. Marks: 60

Note: This question paper contains two parts A and B.

i) **Part - A** for 10 marks, ii) **Part - B** for 50 marks.

- Part-A is a compulsory question which consists of ten sub-questions from all units carrying equal marks.
- Part-B consists of **ten questions** (numbered from 2 to 11) **carrying 10 marks each**. From each unit, there are two questions and the student should answer one of them. Hence, the student should answer five questions from Part-B.

PART- A**(10 Marks)**

- State Kirchoff's Voltage law. [1]
- What are the dependent sources? [1]
- Define peak factor. [1]
- What is the significance of operator 'j'? [1]
- State reciprocity theorem. [1]
- State Norton's theorem. [1]
- Write the relation between line and phase voltages in star connected system. [1]
- What is meant by unbalanced load? [1]
- Define Tree. [1]
- Define self-inductance. [1]

PART - B**(50 Marks)**

- By considering a suitable example, explain the star-to-delta transformation for a resistive network.
- Find all the branch currents for the network shown below figure 1. [5+5]

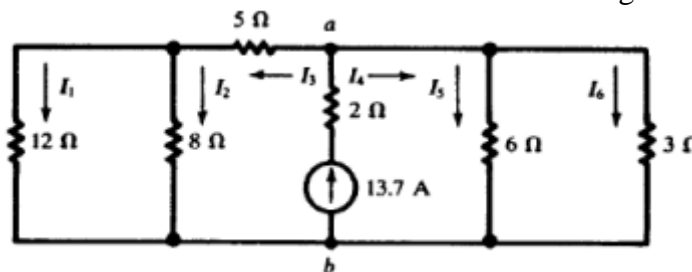


Figure 1

OR

- 3.a) Describe different types of active elements and passive elements in the circuit analysis.
 b) Find the power absorbed by each element in the circuit shown in figure 2. [5+5]

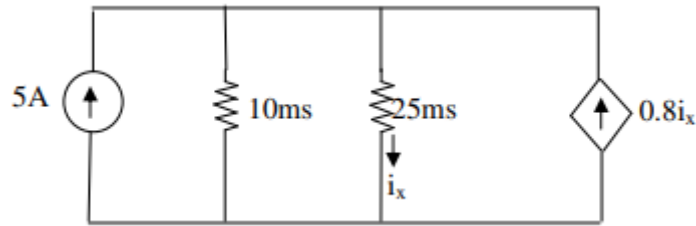


Figure 2

- 4.a) Derive an expression for quality factor RLC series resonant circuit.
 b) A series RC circuit having variable R and $C=20\ \mu\text{f}$ is supplied from AC source having voltage $V=200\ \text{V}$ at $\omega=2000\ \text{rad/sec}$. Draw current locus for sample values of $R=0, 5, 15, 25, 35, 50\ \Omega$. [5+5]

OR

5. Define RMS value, Average value and form factor of an alternating quantity. Determine these values for the periodic function shown in figure 3. [10]

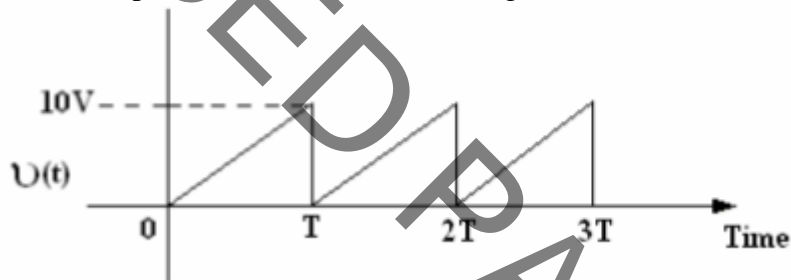


Figure 3

- 6.a) Use the superposition theorem to find v in the circuit of below Figure 4.

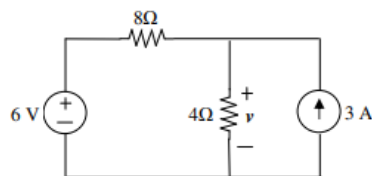


Figure 4

- b) Discuss about the duality exists between Thevenin's theorem and Norton's theorem. [5+5]

OR

- 7.a) Using Norton's theorem, find the equivalent circuit to the left of the terminals in the circuit of below figure 5. Then find I .

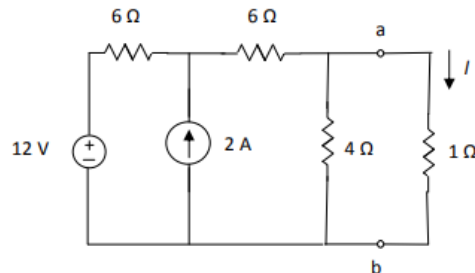


Figure 5

- b) Find the change in current in the branch (6-j8) when 4 ohms resistor is changed to 5 ohms. Use compensation theorem. What is the new current in that branch the figure 6? [5+5]

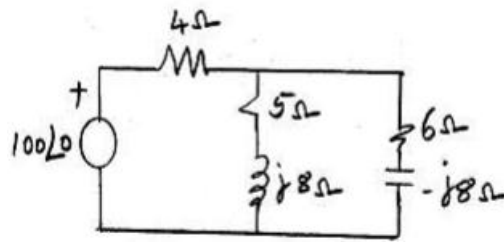


Figure 6

- 8.a) Derive the relation between line and phase quantities in star connected system with necessary diagrams.
 b) A 400 V, 3-phase, balanced supply is connected to an unbalanced delta load having three impedances $Z_{AB} = 106 \angle -90^\circ \Omega$, $Z_{BC} = 63.25 \angle 71.56^\circ \Omega$, $Z_{CA} = 100 \Omega$. Calculate line currents and power consumed if (i) the phase sequence is ABC and (ii) the phase sequence ACB. [5+5]

OR

9. A balanced mesh connected load of $(12 + j9)$ ohm per phase is connected to a three phase, 400 V supply. Find (a) line current, (b) power factor, (c) power, (d) reactive volt-amperes and (e) total volt amperes. [10]

- 10.a) Explain the dot convention in coupled circuits.
 b) Explain the steps involved in finding the fundamental cut sets and also list its properties. [5+5]

OR

11. Draw the oriented graph of the network shown in figure 7 below and write the cut set matrix. [10]

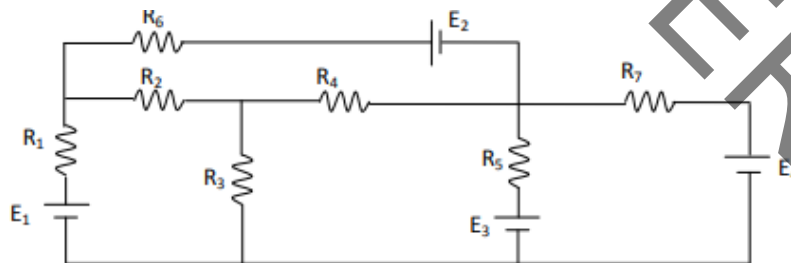


Figure 7

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