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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute)

Affiliated to Dr. A.P.J. Abdul Kalam Technical University, Uttar Pradesh, Lucknow)

B.Tech.

SEM: I - THEORY EXAMINATION (2021 - 2022)

Subject: Principles of Electrical Engineering

Time: 03:00 Hours

Max. Marks: 50

## General Instructions:

1. All questions are compulsory. It comprises three Sections A, B and C.
  - Section A - Question No- 1 is objective type question carrying 1 mark each & Question No- 2 is very short type questions carrying 2 marks each.
  - Section B - Question No- 3 is Long answer type - I questions carrying 5 marks each.
  - Section C - Question No- 4 to 8 are Long answer type - II questions carrying 4 marks each.
  - No sheet should be left blank. Any written material after a Blank sheet will not be evaluated/checked.

## SECTION A

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## 1. Attempt all parts:-

- |      |   |   |
|------|---|---|
| 1-a. | Kirchhoff's voltage law is concerned with..... (CO1)  | 1 |
|      | <ol style="list-style-type: none"> <li>1. IR drop</li> <li>2. Battery emfs</li> <li>3. Both (a) and (b)</li> <li>4. None of these</li> </ol>  |   |
| 1-b. | Three equal resistances of value R are connected in star. If this star is converted into equivalent delta, the resistance value of delta networks will be.....(CO2)                   | 1 |
|      | <ol style="list-style-type: none"> <li>1. R/3</li> <li>2. 3R</li> <li>3. 9R</li> <li>4. None of the above</li> </ol>  |   |
| 1-c. | A sinusoidal voltage has peak to peak value of 100 V. The rms value is (CO3)  | 1 |
|      | <ol style="list-style-type: none"> <li>1. 50</li> <li>2. 100</li> <li>3. 70.7</li> <li>4. 141.4</li> </ol>  |   |
| 1-d. | The relation between number of turns for step up transformer is ..... (CO4)   | 1 |
|      | <ol style="list-style-type: none"> <li>1. <math>N_1 &gt; N_2</math></li> <li>2. <math>N_1 &lt; N_2</math></li> <li>3. <math>N_1 = N_2</math></li> <li>4. None of the above</li> </ol> |   |
| 1-e. | Which of the following is not a method of earthing? (CO5)   | 1 |
|      | <ol style="list-style-type: none"> <li>1. Plate Earthing</li> <li>2. Pipe Earthing</li> <li>3. Earthing through Air Medium</li> <li>4. Rod Earthing</li> </ol>                        |   |

2. Attempt all parts:-

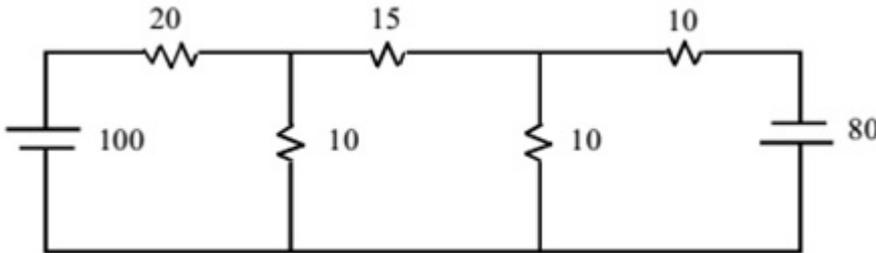
- 2-a. Two resistor of  $3\Omega$  and  $5\Omega$  are connected in series. If the net voltage across the series combination is  $40\text{ V}$ . find the voltage across each resistor. (CO1) 2
- 2-b. Derive the expression for Star to Delta transformation.(CO2) 2
- 2-c. Prove that in a purely inductive circuit the current lags voltage by  $90^\circ$  . (CO3) 2
- 2-d. Explain the current ratio of a transformer . (CO4) 2
- 2-e. List the essential torques required in an indicating instruments. (CO5) 2

SECTION B

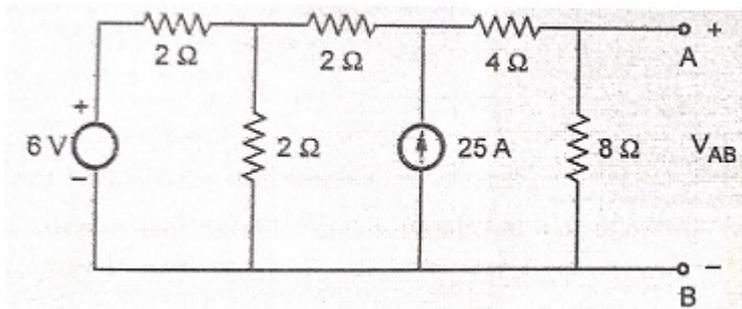
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3. Answer any three of the following:-

- 3-a. Find the current in various branches of circuit. Using mesh Analysis. (CO1) 5



- 3-b. Consider the circuit diagram shown in fig. Determine open circuit voltage across AB terminal shown in fig. by thevenin's theorem. (CO2) 5



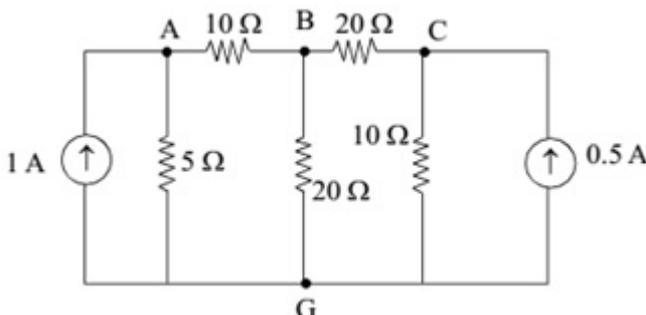
- 3-c. A balanced delta connected load impedance  $16+j12\text{ ohm}$  phase is connected to a three phase  $400\text{V}$  supply. Find the phase difference , line current and power factor . (CO3) 5
- 3-d. Derive the current expression for charging of a capacitor. (CO4) 5
- 3-e. Explain the need of earthing and different methods of earthing. Also list the limitations of each method. (CO5) 5

SECTION C

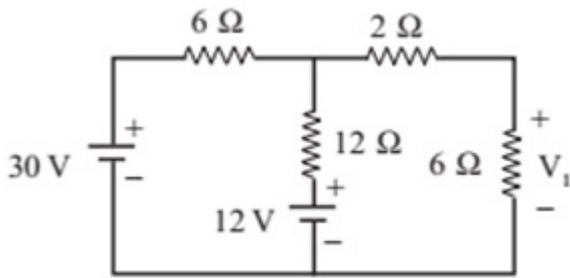
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4. Answer any one of the following:-

- 4-a. Find current in each branch by using nodal analysis. Also calculate total power loss. (CO1) 4

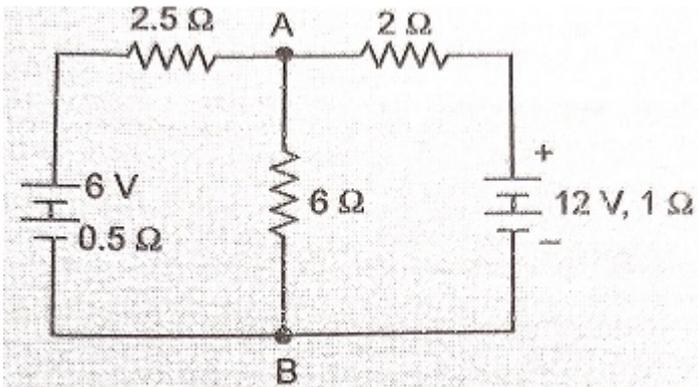


- 4-b. Find the voltage  $V_1$  across  $6\text{ ohm}$  resistance using mesh analysis method. (CO1) 4

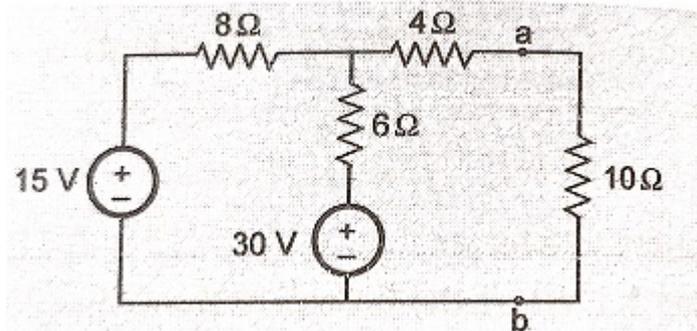


5. Answer any one of the following:-

- 5-a. Using superposition theorem, calculate the current in the AB branch in the circuit shown below. (CO2) 4



- 5-b. Determine the current in 10 ohm resistance using Norton's theorem in the following circuit. (CO2) 4



6. Answer any one of the following:-

- 6-a. Derive the relation between line and phase quantities in a three phase star connected circuit. Derive the expression for the power. (CO3) 4
- 6-b. Explain the admittance method to solve parallel AC circuit. (CO3) 4

7. Answer any one of the following:-

- 7-a. A 30KVA, 2000/200 V, Single phase, 50Hz transformer have a primary resistance of 3.5 ohms and reactance of 4.5 ohms. The secondary resistance and reactance are 0.015ohms and 0.02 ohms respectively. Find (i) Equivalent resistance, reactance and impedance referred to the primary side (ii) Total copper losses in the transformer. (CO4) 4
- 7-b. A 6600/440 V, single phase 600 kVA transformer has 1200 primary turns. Find (i) Transformation ratio (ii) Secondary turns , (iii) Voltage per turn (iv) Secondary current when it supplies a load of 400kW at 0.08 power factor lagging. (CO4) 4

8. Answer any one of the following:-

- 8-a. Explain the working principle of thermocouple and also explain the types and laws of 4

thermocouple. (CO5)

- 8-b. Explain with a neat diagram, the constructional features and working of single phase dynamometer type wattmeter. Also write its merit and demerits. (CO5) 4