Assignment

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Course title : Linear circuit Analysis
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Q1:(a) What is the main difference between a lumped network and distributed network?

Ans: Lumped network:

A network in which all the network elements are physically seperable is known as lumped network. Most of the electric networks are lumped in nature which consists elements like R, L, C voltage source etc.

- Distributed network:

A network in which the circuit elements like R, L and C cannot be physically seperable for analysis purpose is called distributed network.

The best example of such a network is a transmission line where resistance inducture and capacitance of a T/c are distributed all along its length

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and cannot be shown as a seperate elements.

Q1: (b) Why do we mostly use parallel electrical connection in house wiring?
Ans: When appliances are connected in a parallel arrangement each of them can be put on and off independently. This is a feature that is essential in a house's wiring. Also if the appliances were wired in series the potential difference across each appliance would vary depending on the resistance of the appliance.

Q2: (a) What is the importance of ohm's Law for a student of Electrical Technology/Engineering?
Ans: Ohm's law is vitally important to describing electric circuits because it releates the voltage to the current, with the resistance value moderating the relationship between the two. Because of this you can use ohm's law

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to control the amount of current in a circuit, adding resistors to reduce the current flow and taking them away to increase the amount of current.
It can also be extended to describe electrical power (the rate of energy flow per second), because power P = IV, and so you can use it to ensure your circuit provides enough energy to, say, a 60-watt appliance.
For engineering students, the most important thing about ohm's law is that it allows you to analyze circuit diagrams, especially when you combine it with kirchhoff's law.

(Q2: (b) Why the resistance increases with temperature in conductors?
Ans: Heating a metal conductor makes it more difficult for electricity to flow through it. These collisions cause resistance and generate heat. Heating the metal conductor cause atoms to vibrate more which in turn makes it more difficult for

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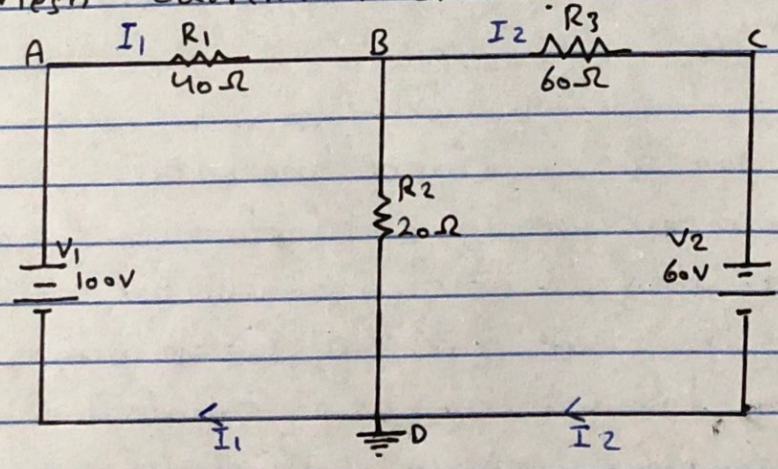
the electrons to flow, increasing resistance.
Resistance increases, in case of conductor with increase in temperature and decrease in case of insulator, due to increase in temperature. In case of conductor the valance band and conduction band overlap with each other, so there are excess electron in conduction of a conductor.

Q3: In the network shown below, find the magnitude of current by Mesh current Method?



Ans: Solution:

Applying KVL on both mesh ABDA

$100 - 40I_1 - 20(I_1 - I_2) = 0$

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$100 - 40I_1 - 20I_1 + 20I_2 = 0$

$100 - 60I_1 + 20I_2 = 0$

$100 = 60I_1 - 20I_2 \longrightarrow (1)$

Applying KVL on both mesh BCDB

$-60I_2 - 60 + 20(I_1 - I_2) = 0$

$-60I_2 - 60 + 20I_1 - 20I_2 = 0$

$-80I_2 - 60 + 20I_1 = 0$

$-60 = 80I_2 - 20I_1 \longrightarrow (2)$

Now solving eq(1) and eq(2) by determinant method:-

$$\text{determinant} = \begin{vmatrix} 60 & -20 \\ -20 & 80 \end{vmatrix}$$

$\rightarrow 60 \times 80 - (-20 \times -20)$

$\rightarrow 4800 - (+400)$

$\rightarrow 4800 - 400 = 4400$

$$\text{Now } I_1 = \begin{vmatrix} 100 & -20 \\ -60 & 80 \end{vmatrix} = \frac{100 \times 80 - (-60 \times -20)}{4400}$$

$$\rightarrow \frac{8000 - (+1200)}{4400}$$

$$\rightarrow \frac{8000 - 1200}{4400} = \frac{6800}{4400} = \frac{68}{44} = (1.54)$$

$\rightarrow \boxed{I_1 = 1.54A}$

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Now $I_2 = \dfrac{\begin{vmatrix} 60 & 100 \\ -20 & -60 \end{vmatrix}}{4400}$

$\rightarrow \dfrac{60x-60-(-20\times100)}{4400}$

$\rightarrow \dfrac{-3600+2000}{4400} = \dfrac{-1600}{4400} = \dfrac{-16}{44}$

$\rightarrow \boxed{I_2 = -0.36A}$