INU PESH

Final Term

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Subject : Electrical Circuit

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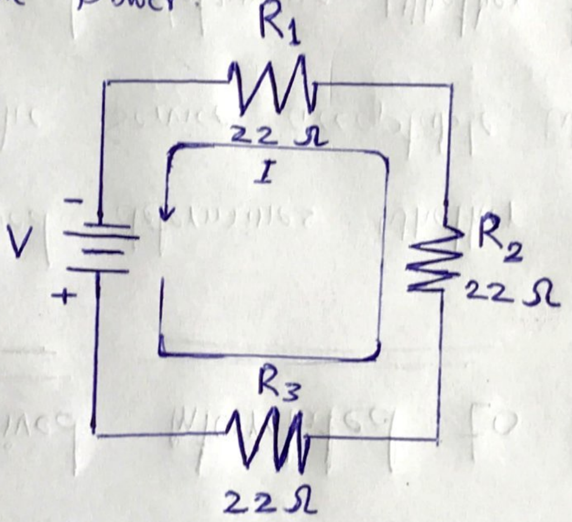
Q# 1.- PART a). Show with the help of diagram that the Current is the Same at all points in a Series Circuits ?

Answer:-

The Current in a Series Circuit is the Same at each resistor Present in the Circuit.

Since each light bulb has the Same resistance ("identical bulbs") and Same Current, they will have the Same Power.

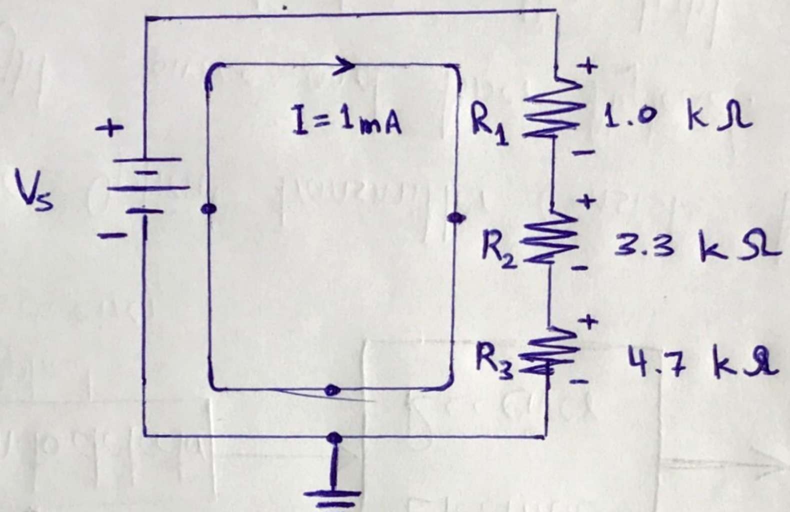


⇒

Diagram shows three resistors Connected in Series to a dc voltage Source. At any Point in this Circuit, the Current into that point must equal the Current out of that Point, as illustrated by the Current directional arrows. Notice also that the Current out of each resistor must equal that the Current into each resistor because there is no place where part of the Current can branch off and go somewhere else.

PART b). Calculate the voltage across each resistor in the following diagram and find the value of V_s.
To What maximum value Can V_s be raised if the Current is to be limited to 5mA?

Answer:-



Solution:- By ohm's law, the voltage across each resistor is equal to its resistance multiplied by the Current through it. Use the ohm's law formula $V = IR$ to determine the voltage across each of resistors. keep in mind that there is the Same Current through each series resistor.

The voltage across R_1 (designated V_1) is

$$V_1 = IR_1 = (1mA)(1.0\,k\Omega) = 1V$$

The voltage across R_2 is

$$V_2 = IR_2 = (1mA)(3.3\,k\Omega) = 3.3V$$

The voltage across R_3 is

$$V_3 = IR_3 = (1mA)(4.7\,k\Omega) = 4.7V$$

To find the value of V_s, find determine RT.

$$R_T = 1.0\,k\Omega + 3.3\,k\Omega + 4.7\,k\Omega = 9\,k\Omega$$

The Source voltage V_s is equal to the Current times the total resistance.

$$V_s = IR_T = (1mA)(9k\Omega) = 9\,V$$

Notice that if you add the voltage drops of the resistors, they total 9V, Which is the Same as the Source voltage.

V_s Can be increased to a Value Where $I = 5mA$

Calculate the maximum value of V_s as follows:

$$V_{s(max)} = IR_T = (5mA)(9k\Omega) = 45\,V$$

Q# 2:- PART a). If we Connect multiple Voltage Sources in a Parallel Circuit, then how to determine the voltage across each parallel branch?

Answer:- Connecting voltage Sources together

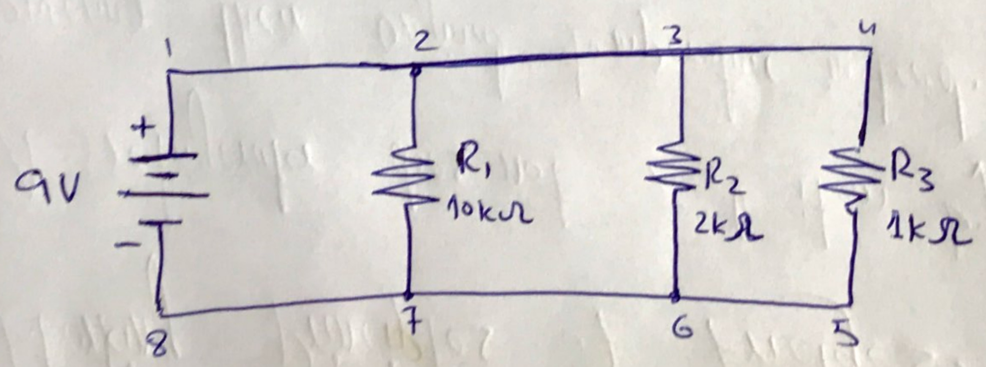
Ideal voltage Sources can be Connected together in both Parallel or series the same as for any Circuit element. Series voltages add together while Parallel Voltages have the Same value.

Note that unequal ideal voltage sources cannot be Connected directly together in Parallel.

⇒ Multiply the Current by the total resistance to get voltage drop, according to ohm's Law $V = IR$.

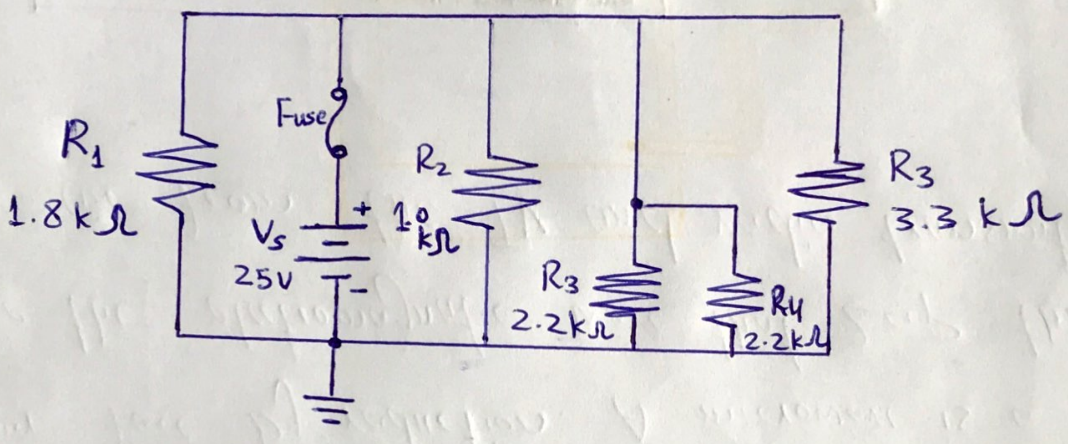
This equals the voltage drop across the entire Parallel Circuit and each resistor in the parallel Circuit. For this example, the voltage drop is given

$V = 5\,A \times 15/7\,\Omega = 75/7\,V$.



PART b):- Determine the voltage across each resistor in the following circuit?

Answer:-

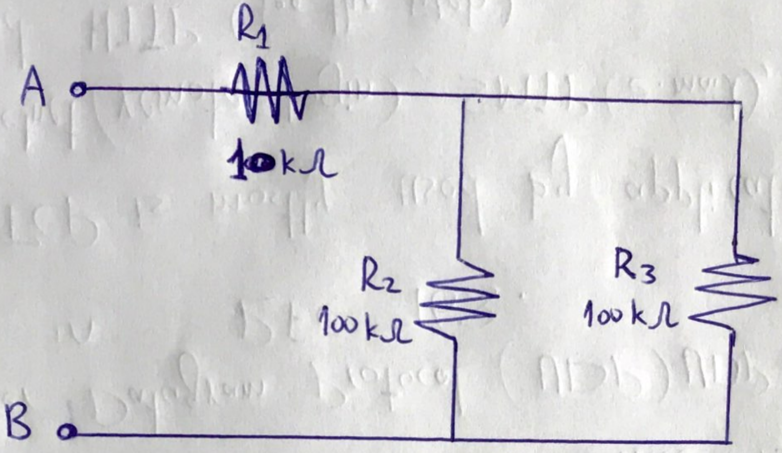


Solution:- The five resistors are in parallel, So the Voltage across each one is equal to the applied Source voltage. There is no voltage across the fuse. The voltage across the resistors is

$$V_1 = V_2 = V_3 = V_4 = V_5 = V_S = 25V$$

Q# 3:- PART a). Determine R_T of the following Circuit between A and B ?

Answer :-



Solution :- First, Calculate the equivalent Parallel resistance of R_2 and R_3 Since R_2 and R_3 are equal in value, you Can use Equation 6-4.

$$R_{2\|3} = \frac{R}{n} = \frac{100\Omega}{2} = 50\,\Omega$$

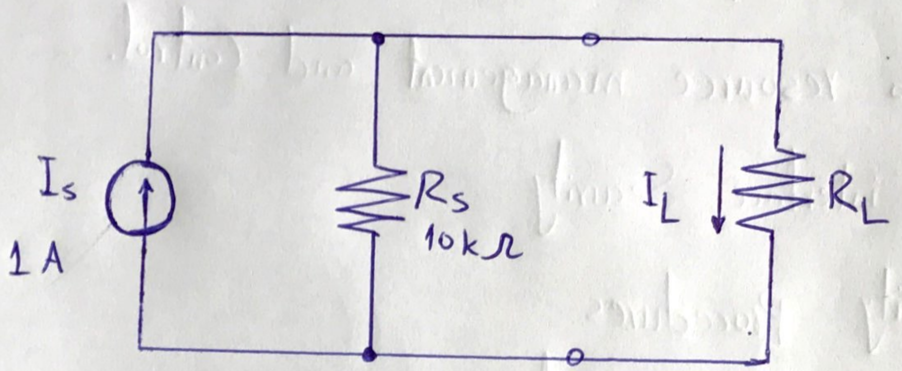
Notice that the term $R_{2\|3}$ is used here to designate the total resistance of a portion of a Circuit in order to distinguish it from the total resistance, R_T, of the complete Circuit.

Now, Since R_1 is in Series with $R_{2\|3}$, add their values as follows:

$$R_T = R_1 + R_{2\|3} = 10\,\Omega + 50\,\Omega = 60\,\Omega$$

Q# 4:- Calculate the load Current (I_L) in the following Circuit for the following of R_L : 100 kΩ, 560Ω and 1.0 kΩ.

Answer:-



Solution:-

For R_L = 100kΩ the load Current is

$$I_L = \left(\frac{R_s}{R_s + R_L}\right) I_s = \left(\frac{10k\Omega}{10.1\,k\Omega}\right) 1A = 990\,mA$$

For R_L = 560Ω,

$$I_L = \left(\frac{10\,k\Omega}{10.56\,k\Omega}\right) 1A = 947\,mA$$

Q# 5. Write short note on the following?

1. Thevenin Theorem

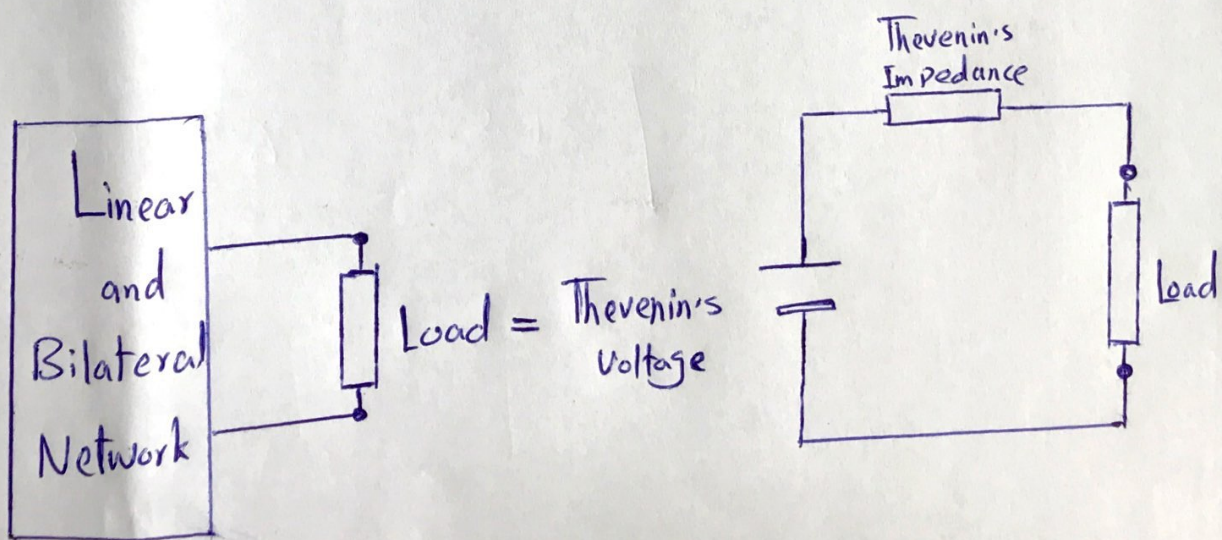
2. Superposition

Answer:- Thevenin Theorem:

Thevenin Theorem States that "Any linear Circuit Containing several voltages and resistances Can be replaced by just one single voltage in series with a single resistance Connected across the load".

OR Thevenin theorem provides a method for simplifying a Circuit to a standard equivalent form.

This theorem Can be used to simplify the analysis of complex Circuits.



2:- Superposition Theorem :

The Superposition theorem states that for a linear System (notably including the Subcategory of time - invariant linear Systems) the response (voltage or Current) in any branch of a bilateral linear Circuit having more than one independent Source equals the algebric Sum of the responses Caused by each independent Source.

The steps in applying the Superposition method are as follows:

Step 1 :- leave one voltage (or Current) Source at a time in the Circuit and replace each of the other voltage (or Current) sources with its internal resistance.

Step 2: Determine the particular Current (or voltage) that you want just as if there were only one Source in the Circuit.

Step 3: Take the next Source in the Circuit and repeat Step 1 and 2. Do this for each Source.