Presentation
on
SUPERPOSITION THEOREM

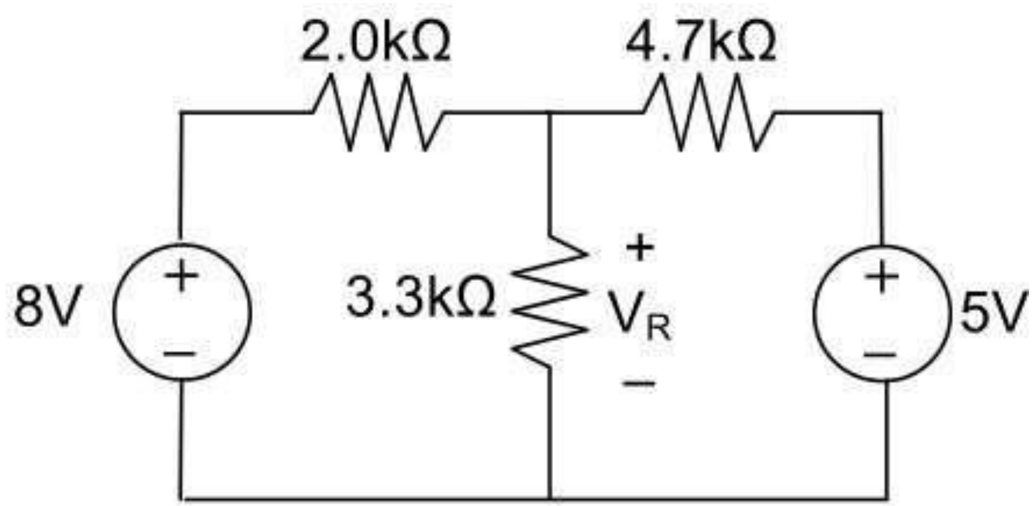
ITMUNIVERSE,

- The superposition theorem for electrical circuits states that for a linear system the response (voltage or current) in any branch of a bilateral linear circuit having more than one independent source equals the algebraic sum of the responses caused by each independent source acting alone, where all the other independent sources are replaced by their internal impedances.

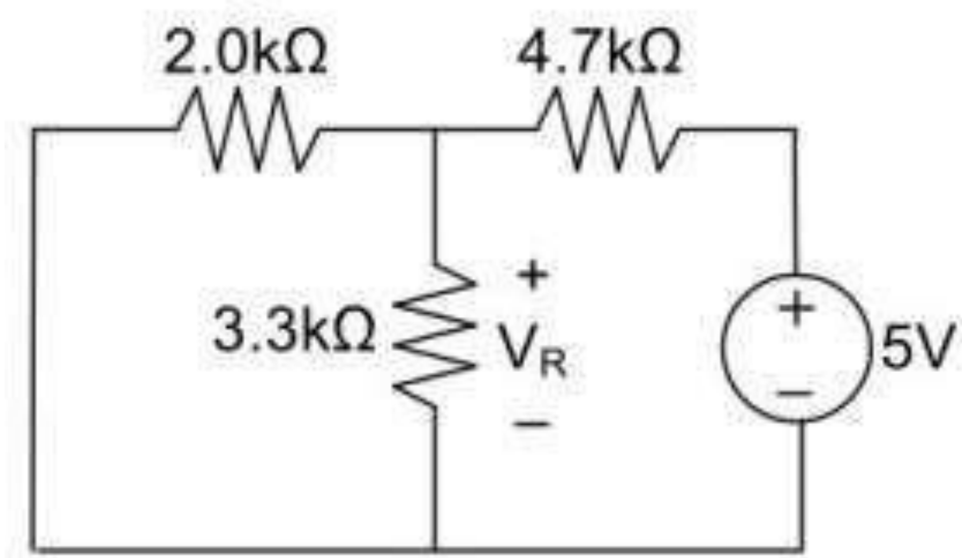
- To ascertain the contribution of each individual source, all of the other sources first must be "turned off" (set to zero) by:
- Replacing all other independent voltage sources with a short circuit (thereby eliminating difference of potential i.e. V=0; internal impedance of ideal voltage source is zero (short circuit)).
- Replacing all other independent current sources with an open circuit (thereby eliminating current i.e. I=0; internal impedance of ideal current source is infinite (open circuit)).

- The theorem is applicable to linear networks (time varying or time invariant) consisting of independent sources, linear dependent sources, linear passive elements (resistors, inductors, capacitors) and linear transformers.
- Another point that should be considered is that superposition only works for voltage and current but not power.

Example: Using the superposition theorem, determine the voltage drop and current across the resistor 3.3K as shown in figure below.



- **Solution:**
- Step 1: Remove the 8V power supply from the original circuit, such that the new circuit becomes as the following and then measure voltage across resistor.



- Here 3.3K and 2K are in parallel, therefore resultant resistance will be 1.245K.

- Using voltage divider rule voltage across 1.245K will be

- V1= [1.245/(1.245+4.7)]*5 = 1.047V

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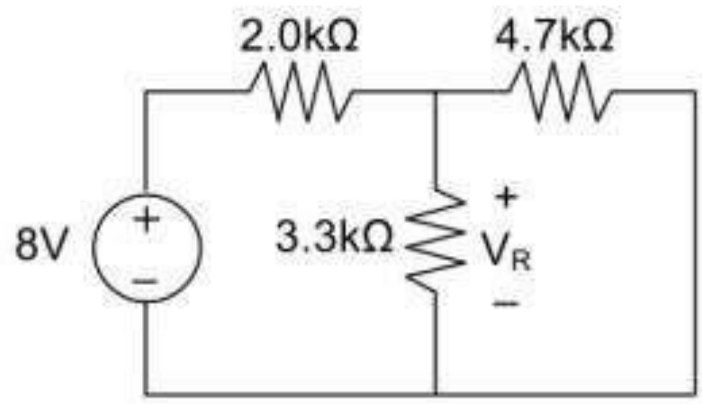
- Step 2: Remove the 5V power supply from the original circuit such that the new circuit becomes as the following and then measure voltage across resistor.



- Here 3.3K and 4.7K are in parallel, therefore resultant resistance will be 1.938K.
- Using voltage divider rule voltage across 1.938K will be
- V2= [1.938/(1.938+2)]*8 = 3.9377V
- Therefore voltage drop across 3.3K resistor is V1+V2 = 1.047+3.9377=4.9847

Thank You