

SUPERPOSITION THEOREM

The superposition theorem is used when more than one source are given in the network. It is very useful in circuit analysis. It is used in converting any circuit into its \hat{A} Norton equivalent \hat{A} or \hat{A} Thevenin equivalent.

Statement

The response in any element of linear bilateral network containing more than one source is equal to the sum of the response produced by source acting independently.

Procedure

Step 1 \hat{A} “ Consider a single source acting alone. Deactivate all other sources (or simply **remove**) i.e. **replace voltage source by short circuit and current source by open circuit**, if internal impedance is zero. If internal impedance is known, replace them by their internal impedance.

NOTE: Dependent sources must be kept as they are.

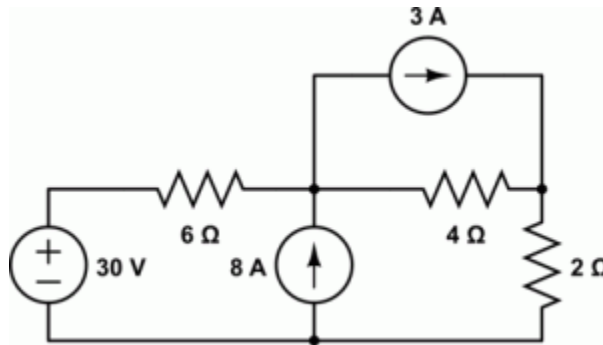
Step 2 \hat{A} “ Find the current through or the voltage across the required elements due to source under consideration.

Step 3 \hat{A} “ Repeat Step 1 and step 2 for each source.

Step 4 – Add up all the responses produced by each source to get cumulative response. Consider the direction for current and polarity for voltages while adding them.

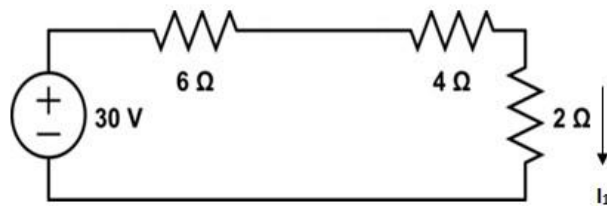
Example

Determine the value I_1 shown in fig. using superposition theorem.



SOLUTION

Case -1



$$I_1^{\text{TM}} = V/R = 30/12 = 2.5 \text{ A}$$

Case – 2

