UNIT I

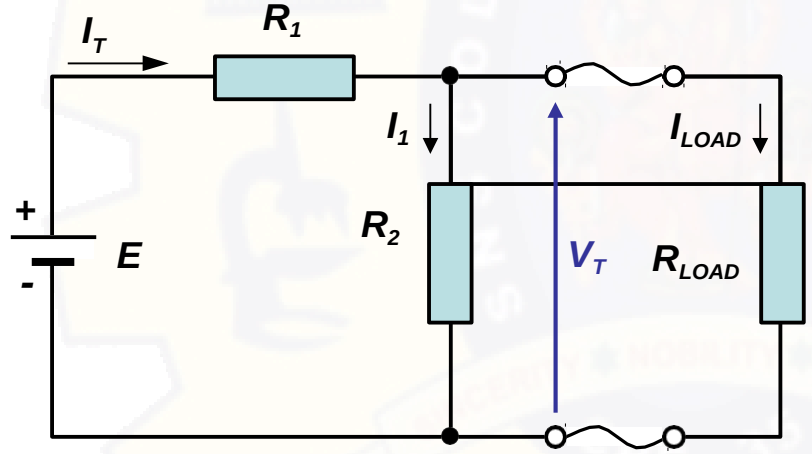
Voltage Divider Rule
&
Current Divider Rule

DC CIRCUITS

Voltage Divider Principle

Voltage divider circuits are used in electronics to supply a *range of voltages needed by a system from a single source.*

The voltage divider uses the principles of Ohm's law to *generate the necessary voltages.*



V_T no load conditions.

$$V_T = E \frac{R_2}{R_1 + R_2}$$

V_T loaded conditions ($I_{LOAD} << I_1$)

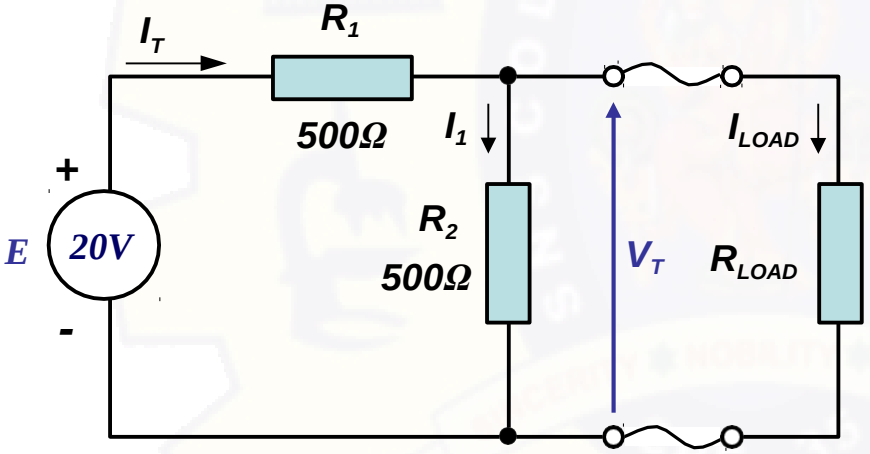
$$V_T \sim E \frac{R_2}{R_1 + R_2}$$

For good stability current I_1 must be at least ten times that flowing in the load.

Voltage Divider Principle

Activity

Determine the voltage VT under no load conditions and when a resistance of 2000 ohms in connected.



V_T no load conditions.

$$V_T = E \frac{R_2}{R_1 + R_2}$$

V_T loaded conditions ($I_{LOAD} << I_1$)

$$V_T \sim E \frac{R_2}{R_1 + R_2}$$

For good stability current I_1 must be at least ten times that flowing in the load.

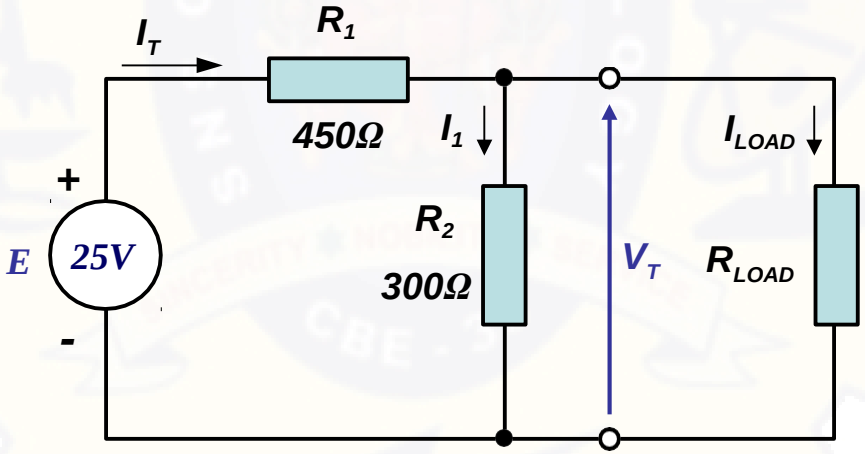
Divider Networks

Activity

1. ***For the potential divider circuit shown, use the voltage divider principle to evaluate the voltage at V_T a) when open circuit and b) when a load of 1000Ω is connected as shown.***

2. ***If the load resistance (R_{LOAD}) increased to 5kΩ what will be the effect on the voltage V_T .***

3. ***Comment on your results***

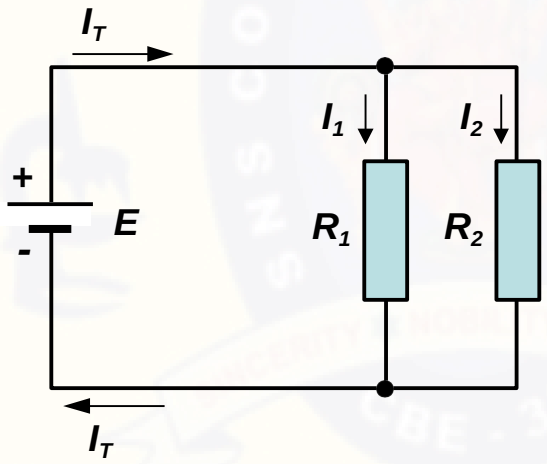


What is the effect on the voltage (V_T) supplied by the potential divider network as the load (R_{LOAD})varies.

Current Divider Principle

In parallel circuits the current I_T divides up through the various branch networks, I_1, I_2.

The ratio between any two branch currents is the inverse ratio of the branch resistances.



$$I_1 = I_T \frac{R_2}{R_1 + R_2}$$

$$I_2 = I_T \frac{R_1}{R_1 + R_2}$$

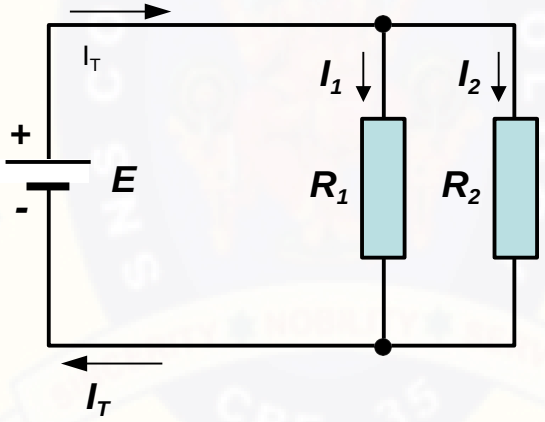
This procedure is only suitable where there are two parallel branches.

Current Divider Principle

When there are only two resistances in parallel we can simplify some of the *Ohm's law calculation by use of the current divider principle.*

The current divider uses the principles of Ohm's law to generate the branch currents I_1 and I_2.

$$I_T = \frac{E}{R_{eff}}$$



$$I_1 = I_T \frac{R_2}{R_1 + R_2}$$

$$I_2 = I_T \frac{R_1}{R_1 + R_2}$$

This procedure is only suitable where there are two parallel branches.

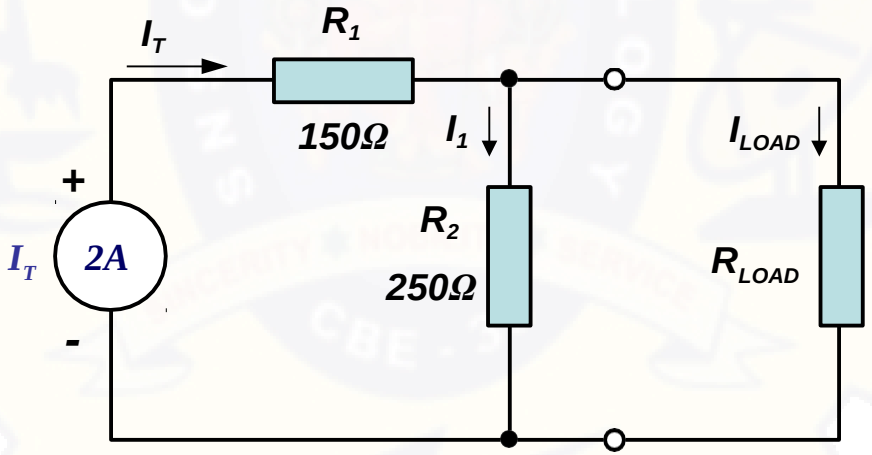
Divider Networks

Activity

1. ***For the network shown, use the current divider principle to evaluate the branch currents if R_{LOAD} is 1000Ω.***

2. ***If the load resistance (R_{LOAD}) is reduced to 500Ω what current will flow in each branch assuming the source current stays the same at 2A.***

3. ***Comment on your results.***



What is the effect on the branch currents supplied by the 2A current source as the load (R_{LOAD})varies.