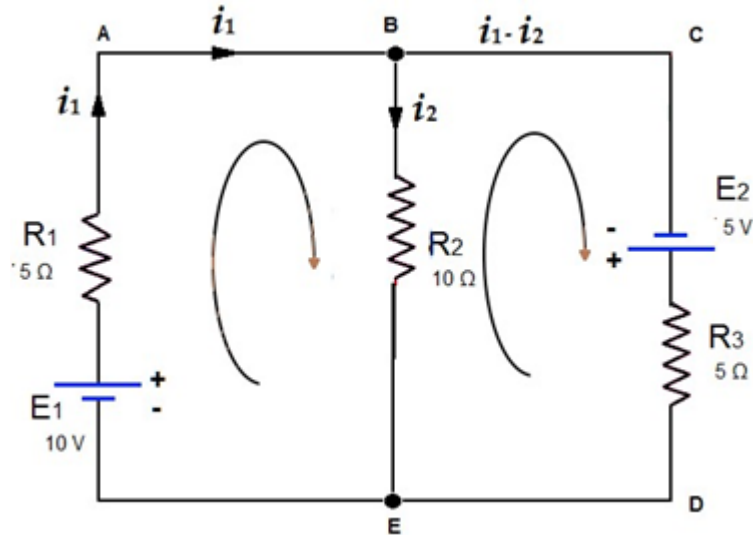


**Example 1)** Consider a circuit of resistors  $R_1$ ,  $R_2$  and  $R_3$  whose values are  $5\ \Omega$ ,  $10\ \Omega$  and  $5\ \Omega$  respectively. Two cells  $E_1$  and  $E_2$  are connected in the circuits whose values are  $10\ \text{V}$  and  $5\ \text{V}$  respectively. Find the value of  $i_1 - i_2$ .



**Solving the circuit by KCL and KVL**

Consider the direction of current flow as indicated by arrows within the circuit. Now let us apply Kirchhoff's current law to the junctions B and E.

So current in the mesh EAB =  $i_1$ .

Current in the mesh BE =  $i_2$ .

Thus current in the mesh BCDE =  $i_1 - i_2$ .

Next we are applying Kirchhoff's voltage law on the mesh EAB. Here  $10\ \text{V}$  is considered in the clock wise direction.

$5 i_1 + 10 i_2 = 10$ . Let it be the first equation.

Consider the next mesh EBCD in which  $5\ \text{V}$  is again in the clock wise direction.

$$5 (i_1 - i_2) - 10 i_2 = 5$$

$$5 i_1 - 5 i_2 - 10 i_2 = 5$$

$$5 i_1 - 15 i_2 = 5$$

Solving the two equations we get

$$5 i_1 + 10 i_2 = 10 -$$

$$5 i_1 - 15 i_2 = 5$$

$$\text{Then } 10 i_2 - (- 15i_2) = 5$$

$$10 i_2 + 15 i_2 = 5 \text{ Thus}$$

$$25 i_2 = 5 \quad i_2 = 5/25$$

$$= 0.2 \text{ A}$$

Substitute this value in equation 1 we get  $5 i_1 + 10 (0.2) = 10$

$$5 i_1 + 2 = 10 \quad 5 i_1 =$$

$$8 \quad i_1 = 8 / 5 = 1.6 \text{ A}$$

Thus  $i_1 = 1.6 \text{ A}$  and  $i_2 = 0.2 \text{ A}$

$$i_1 - i_2 = 1.6 - 0.2 = 1.4 \text{ Amp.}$$