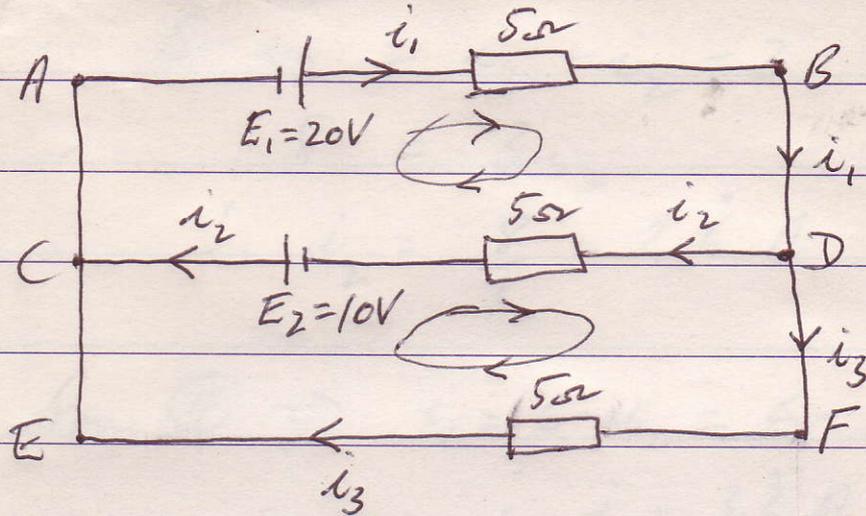


## Kirchhoff's laws - Extension Question



At junction (node) D :  $i_1 = i_2 + i_3$  - ①

Around loop ~~ABCD~~ ABDCA :

$$20 - 5i_1 - 5i_2 + 10 = 0$$

$$30 - 5i_1 - 5i_2 = 0$$

$$6 - i_1 - i_2 = 0 \quad - ②$$

Around loop CDFEC :

$$-10 + 5i_2 - 5i_3 = 0$$

$$-2 + i_2 - i_3 = 0 \quad - ③$$

From ②  $\Rightarrow i_1 = 6 - i_2$  - ④

From ③  $\Rightarrow i_3 = i_2 - 2$  - ⑤

Subst. eqns ④ and ⑤ into ① :

$$\therefore 6 - i_2 = i_2 + i_2 - 2$$

$$\therefore 8 = 3i_2$$

$$\therefore i_2 = \frac{8}{3} = 2.6 \text{ A}$$

So, from (4)  $\Rightarrow i_1 = 6 - i_2 = 6 - 2.6$

$$\therefore i_1 = 3.3 \text{ A}$$

and from (5)  $\Rightarrow i_3 = i_2 - 2 = 2.6 - 2$

$$\therefore i_3 = 0.6 \text{ A}$$

$\therefore$  Current in AB = 3.3 A from A to B.

Current in CD = 2.7 A from D to C

Current in EF = 0.6 A from F to E