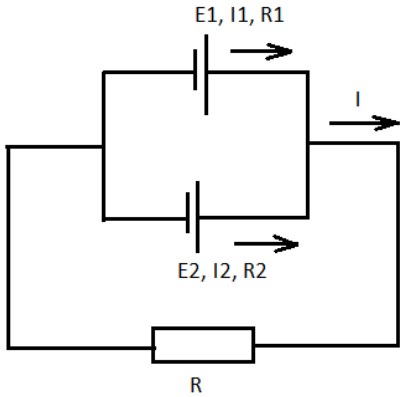


Two cells of emf 1.5 V and 2 V and internal resistance 1 ohm and 2 ohm respectively are connected in parallel so as to send same current in the same direction through an external resistance of 5 ohm . Calculate current in each branch.

Solution.



$$E_1 = 1.5\text{ V} ; E_2 = 2\text{ V}$$

$$R_1 = 1\text{ ohm} ; R_2 = 2\text{ ohm} ; R = 5\text{ ohm}$$

$$I = I_1 + I_2$$

$$E_1 = I_1 R_1 + IR = I_1 (R_1 + R) + I_2 R$$

$$E_2 = I_2 R_2 + IR = I_2 (R_2 + R) + I_1 R$$

$$I_1 = \frac{E_1 - E_2 + I_2 R_2}{R_1}$$

$$E_1 = \frac{E_1 - E_2 + I_2 R_2}{R_1} (R_1 + R) + I_2 R$$

Answer:

$$I_2 = \frac{E_1 R_1 - (E_1 - E_2)(R_1 + R)}{R_1 R + R_2 (R_1 + R)} = \frac{1.5 \cdot 1 - (1.5 - 2)(1 + 5)}{1 \cdot 5 + 2 \cdot (1 + 5)} = \frac{4.5}{17} = \frac{9}{34}\text{ A}$$

$$I_1 = \frac{1.5 - 2 + \frac{9}{34} \cdot 2}{1} = \frac{0.5}{17} = \frac{1}{34}\text{ A}$$

$$I = \frac{9}{34} + \frac{1}{34} = \frac{5}{17}\text{ A}$$