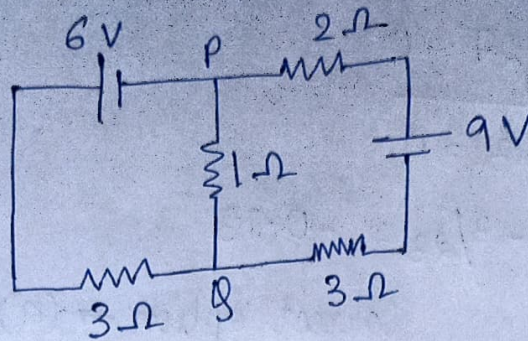


JEE PROBLEMS

JEE MAIN - 2015

Q. In the circuit shown, the current in the 1Ω resistor is,



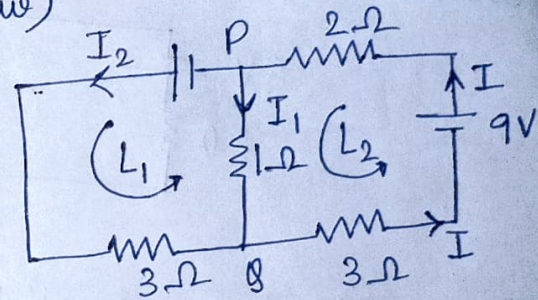
- (a) 0.12 A from Q to P
- (b) 0.13 A from P to Q
- (c) 1.3 A from P to Q
- (d) 0 A

Solution: Approach-1 (Kirchoff's law)

Applying Kirchoff's voltage law, in loop 1 (starting from P)

$$6 - 3I_2 + I_1 = 0$$

$$\Rightarrow 3I_2 - I_1 - 6 = 0 \quad \text{--- (1)}$$



Applying Kirchoff's voltage law in L_2 (starting from P)

$$-I_1 - 3I + 9 - 2I = 0$$

$$\Rightarrow I_1 + 5I - 9 = 0 \quad \text{--- (2)}$$

Applying junction rule at P,

$$I = I_1 + I_2 \quad \text{--- (3)}$$

Substituting eqn. (3) in eqn. (2),

$$6I_1 + 5I_2 - 9 = 0 \quad \text{--- (4)}$$

Solving eqn. (4) & eqn. (1),

$$5x(1) - 3x(4)$$

$$15I_2 - 5I_1 - 30 = 0$$

$$\begin{array}{r} 15I_2 + 18I_1 - 27 = 0 \\ (-) \quad (-) \quad (+) \\ \hline \end{array}$$

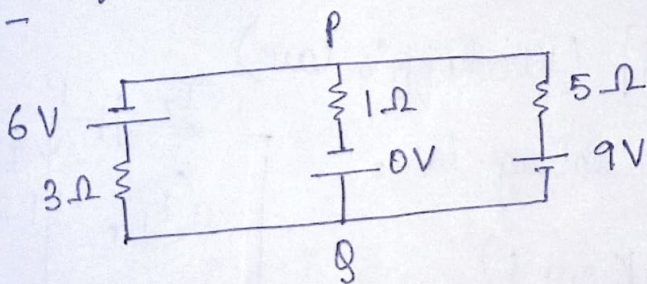
$$-23I_1 - 3 = 0$$

$$\Rightarrow I_1 = -3/23 = -0.13$$

Correct option \rightarrow (a)

Approach - 2 (Shortcut)

Add 0V cell in the PQ arm and combine the series combination of resistors in right arm. The reduced circuit is -



This is a parallel combination of cells with internal resistance

$$E = \frac{6/3 + 0/1 - 9/5}{1/3 + 1/1 - 1/5} = \frac{3}{23} = 0.13 \text{ V}$$

$$I_{PQ} = \frac{E}{1\Omega} = 0.13 \text{ A from +ve to -ve i.e., Q to P}$$