Answer on Question #42904 – Physics – Electric Circuits
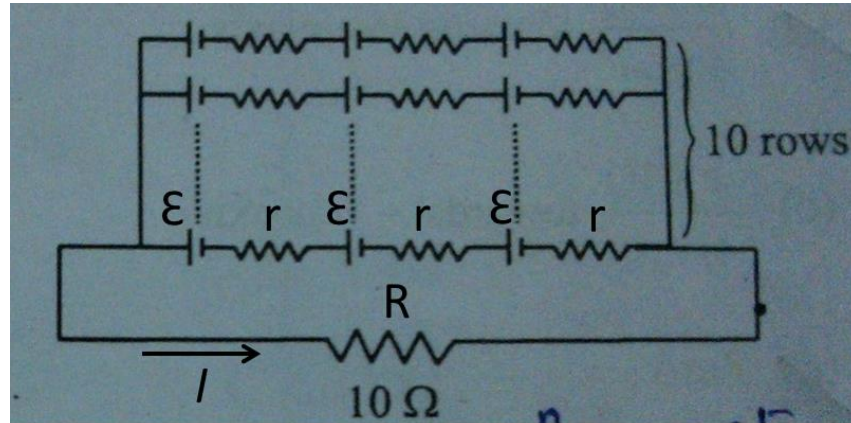
47. In a given circuit, each cell has an e.m.f. of 0.15 V and internal resistance of 0.25 Ω. Find the current in the circuit.

Solution.

Lets sign the circuit current with *I*.

Due to symmetry, as a consequence of Kirchhoff's current law:

$$I = \sum_{i=1}^{10} I_i = 10 I_i$$

Where I_i is a current through one of the branches with e.m.f.

From Kirchhoff's voltage law:

$$3\varepsilon = \frac{1}{10} I \cdot 3r + I \cdot R$$

Therefore:

$$I = \frac{3\varepsilon}{R + \frac{3}{10}r}$$

Numerically:

$$I = \frac{3 \cdot 0.15V}{10\Omega + \frac{3}{10} \cdot 0.25\Omega} \approx 0.045A$$

Answer: (c) 0.045A