Q. 01 **First a set of n equal resistors of R each are connected in series to a battery of emf E and internal resistance R. A current / is observed to flow. Then, the n resistors are connected in parallel to the same battery. It is observed that the current is increased 10 times. What is V?**

Solution: Key concept: The equivalent resistance of series combination is in series with the internal resistance R of battery and in parallel combination of resistors, the equivalent resistance of parallel combination is also in series with the internal resistance of battery.

In series combination of resistors, current I is given by $I = \frac{E}{R + nR}$

whereas in parallel combination current $10I$ is given by

$$\frac{E}{R + \frac{R}{n}} = 10I$$

Now, according to problem,

$$\frac{1+n}{1+\frac{1}{n}} \Rightarrow 10 = \left(\frac{1+n}{n+1}\right)n$$

$$\Rightarrow \quad n = 10$$