Phys 102 – Sec # 41 **Quiz # 9 (Ch. 27)**

Name: Key **ID #**

1- A certain capacitor (initially uncharged), is connected in series with a resistor and a battery. After being charged for 10 ms, the charge on the capacitor is half of its maximum value. What is the time constant (RC) of the circuit?

3

$q = C\mathcal{E}(1 - e^{-t/RC})$ put $t = 10\ ms = 10^{-2}\ s$

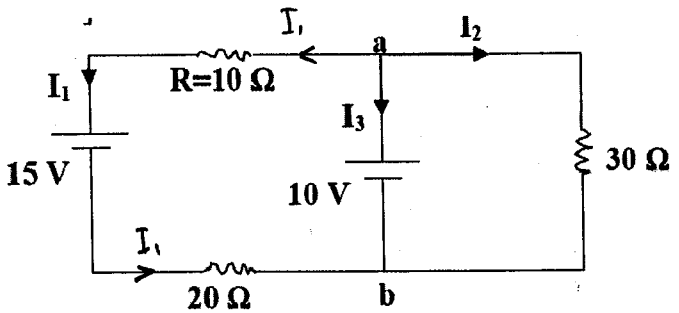
$0.5 = 1 - e^{-\frac{0.01}{RC}}$ solve for RC

$-0.5 = -e^{-\frac{0.01}{RC}}$

$-\frac{0.01}{RC} = \ln 0.5$

$\Rightarrow RC = \frac{-0.01}{\ln 0.5} = 1.4 \times 10^{-2}\ S$

2- In the shown circuit, find the current passing through the 20- Ohm resistor.



3

left loop ↶

$+10 - I_1(10) - 15 - I_1(20) = 0$

$-5 - 30(I_1) = 0$

$I_1 = \frac{-5}{30} = \frac{-1}{6} = -0.17A$

* the current I_1 has a magnitude of (0.17), and in a direction opposite to that drawn in the figure.

4

3- Three 20- Ohm resistors are connected in **Parallel** and the combination is connected to a 10-V battery.

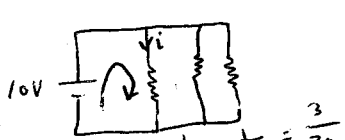
a) What is the current passing in any of the resistors?

total current $I = \frac{\mathcal{E}}{R_{eq}} = \frac{10}{(20/3)} = 1.5\ A$

the current through each resistor

$i = \frac{I}{3} = 0.5\ A$

or use loop rule: $10 - iR = 0 \Rightarrow i = \frac{10}{20} = 0.5\ A$



$\frac{1}{R_{eq}} = \frac{1}{20} + \frac{1}{20} + \frac{1}{20} = \frac{3}{20}$

$R_{eq} = \frac{20}{3}\ \Omega$

b) What is the potential difference across any of the resistors?

V (across any resistor) $= iR = (0.5)(20) = 10\ V$

the same as that of the battery

(because they are connected in parallel)