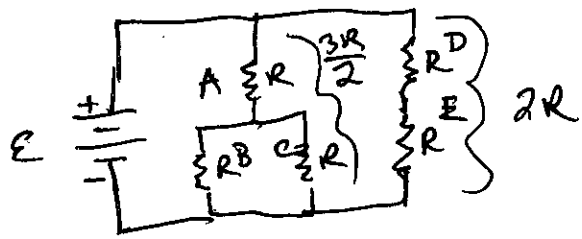
WORKSHOP 10.2

3/26/2009

32-36 Each light bulb is a resistor



$V_{ABC} = \mathcal{E}$ $\quad I_A = \dfrac{\mathcal{E}}{\frac{3}{2}R} = \dfrac{2\mathcal{E}}{3R}$

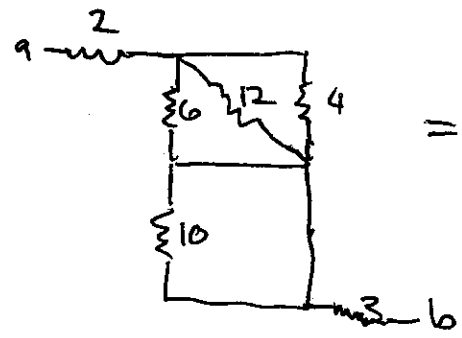
$I_B = I_C = \dfrac{\mathcal{E}}{3R}$

$I_D = I_E = \dfrac{\mathcal{E}}{2R}$

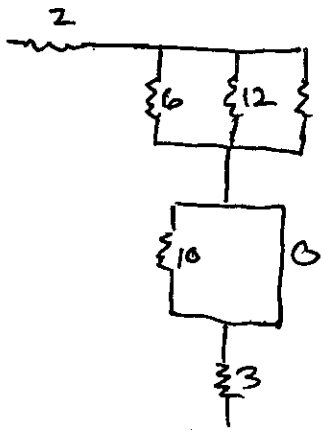
so $\quad I_A > I_D = I_E > I_B = I_C$

$\Rightarrow$ order of brightness $A > D = E > B = C$

32-42



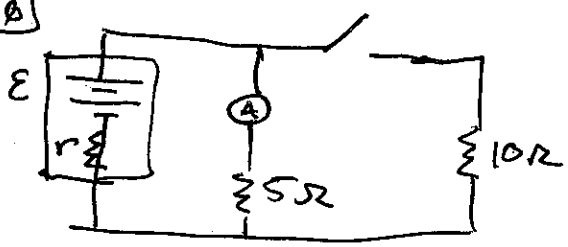
$=$



$= 2 + 3 + \left(\frac{1}{6} + \frac{1}{12} + \frac{1}{4}\right)^{-1}$

$= 5 + 2 = 7\,\Omega$

32-48



open, $I_o = 1.636\ A$

closed $I_c = 1.565\ A$

<u>open</u> $\quad \mathcal{E} = I R_{tot} = I_o (5 + r)$

<u>closed</u> want $\Delta V_{5\Omega}$: $\quad R_{tot} = r + \left(\frac{1}{5} + \frac{1}{10}\right)^{-1}\Omega = r + \frac{10}{3}\Omega$

$$I_{tot} = \frac{\mathcal{E}}{r + \frac{10}{3}\Omega} \Rightarrow \Delta V_r = \frac{\mathcal{E} r}{r + \frac{10}{3}\Omega} \qquad \Delta V_5 = \mathcal{E}\left(1 - \frac{r}{r + \frac{10}{3}\Omega}\right)$$

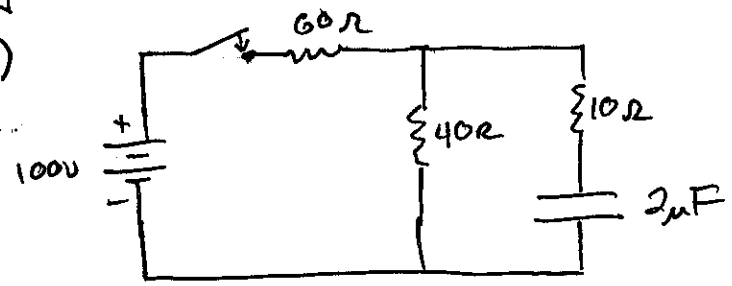
and $I_c = \dfrac{\Delta V_5}{5\Omega} = \dfrac{\mathcal{E}}{5\Omega}\left(\dfrac{10/3\,\Omega}{r + 10/3\,\Omega}\right) = \dfrac{I_o(5+r)}{5}\left(\dfrac{10/3}{r + 10/3}\right)$

$r = 0.5\,\Omega$

$\mathcal{E} = 9\ V$

32-74

a)



at steady state w/ closed switch, capacitor allows no current in rt. half of circuit ($I_{rt}=0$)

thus $V = I_{left}(60\Omega + 40\Omega) = 100V \Rightarrow I_{left} = 1A$

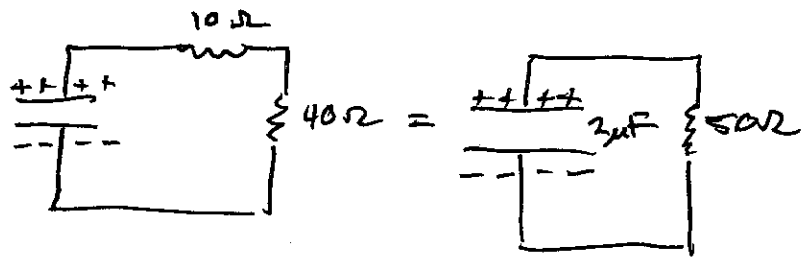
voltage drop across 60Ω resistor = 60V

and capacitor is in ||, thus capacitor has $\Delta V = 40V$

$$Q = C\Delta V_c = (2\times10^{-6}F)(40V) = 80\times10^{-6}C = 80\mu C$$

b) Switch opened at $t=0$

now circuit is just



now $Q = Q_0 e^{-t/\tau}$ with $\tau = CR$

$Q = 0.1 \cdot Q_0$

$\Rightarrow .1 = e^{-t/\tau}$

or $\log(.1) = -\frac{t}{\tau}$

$t = \tau \log(10) = (2\times10^{-6}F)(50\Omega)\log(10) = 2.3\times10^{-4}s$

$t = .23ms$