in class

<u>Tut 6</u>   Q. 2

(a) $\tau = RC = 4.7k \times 56\mu$

$\tau = 0.263\,s$

(b)
$V_c = E\left(1 - e^{-t/\tau}\right)$

$V_c = 22V\left(1 - e^{-t/0.263}\right)$

$i_c = \dfrac{E}{R}\, e^{-t/\tau} = \dfrac{22V}{4.7k}\, e^{-t/0.263} = 4.68\,mA\, e^{-t/0.26}$

$$V_C = E\left(1 - e^{-t/\tau}\right) \qquad E - \overline{\underset{\displaystyle}{}} \; 22V \qquad \quad \Big\} \; \overset{4.7k}{}$$
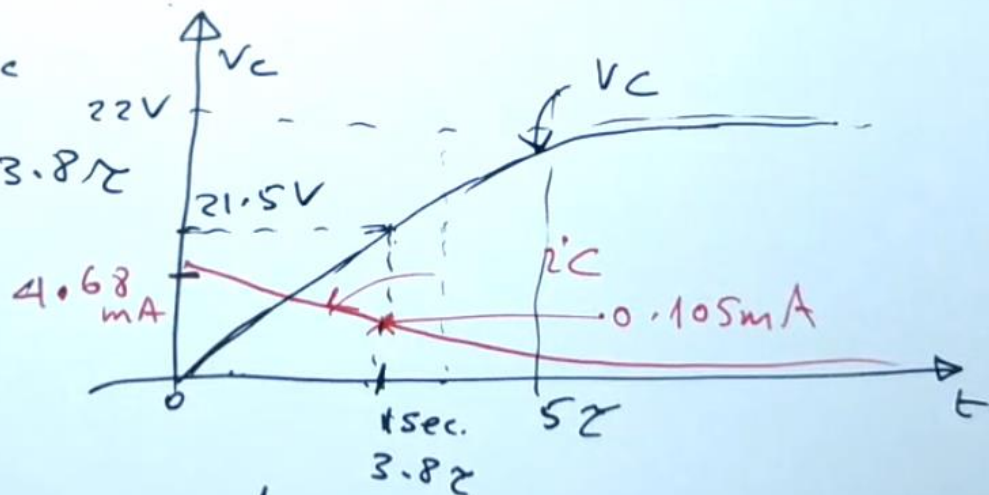
$$V_C = 22V\left(1 - e^{-t/0.263}\right)$$

$$i_C = \frac{E}{R}\, e^{-t/\tau} = \frac{22V}{4.7k}\, e^{-t/0.263} \qquad = 4.68\,mA\, e^{-t/0.26}$$

(c)

$t = 1\,sec$

$\dfrac{1}{0.263} = 3.8\,\tau$

4.68 mA

$$V_C = 22\left(1 - e^{-\frac{1}{0.263}}\right) = 21.5V$$

$$i_C = 4.6\,mA\, e^{-\frac{1}{0.263}} = 0.105\,mA$$

$$\tau = 0.263 \text{ s}$$

$$V_C = V_{max} \, \bar{e}^{\,t/\tau}$$

$$V_C = 21.5V \, \bar{e}^{\,t/0.263}$$

$V_C = 21.5V$

4.7k

2

$$\dot{i}_C = I_{cmax} \, \bar{e}^{\,t/\tau} = 0.105mA \, \bar{e}^{\,t/0.263}$$

(e)

$$5 \times \tau = 5 \times 0.263 = 1.31 s$$

22

4.68mA

VC

ic

2 sec.

$$\tau = (R_1 + R_2) \cdot C$$
$$\tau = (3k + 2k) \times 2\mu$$

(circuit diagram: $+ V_{R_1}$, R_1, $3k$, i_c arrow, switch positions 2^0, 3, $30V$ source, $2\mu F$ capacitor, $+ V_c -$, R_2 $2k$)
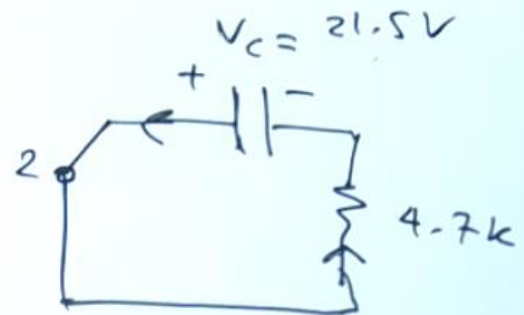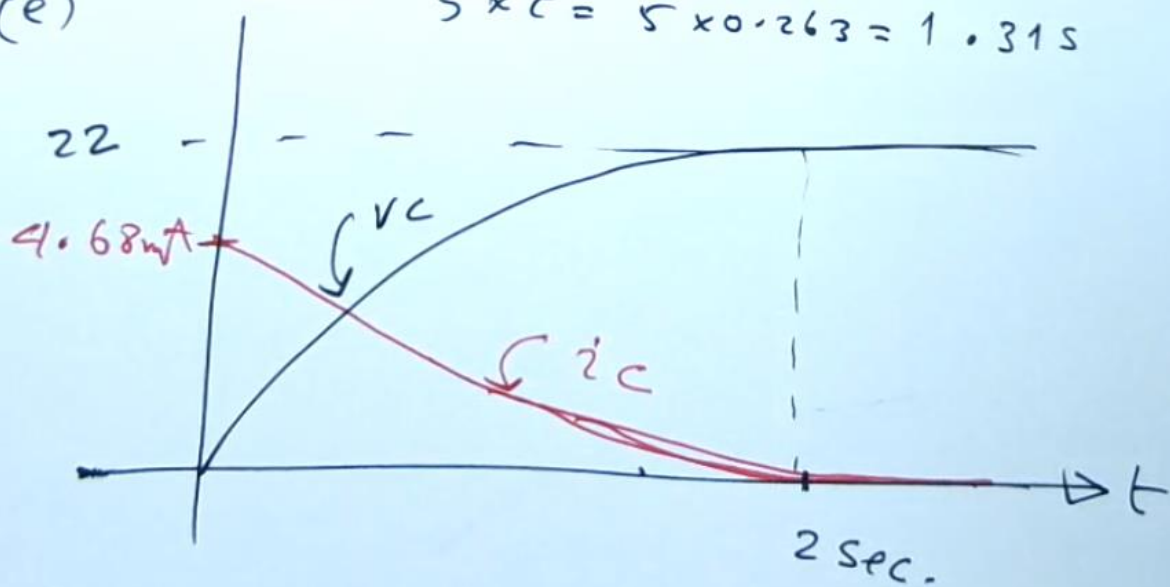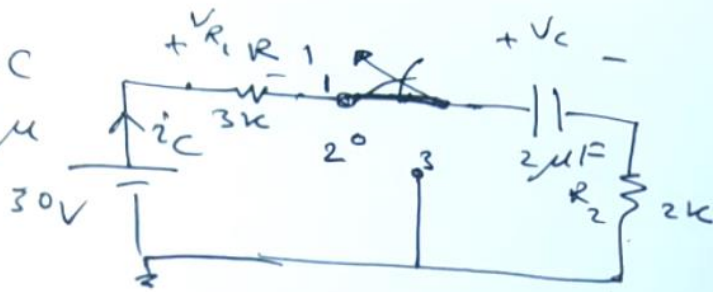
$$\tau = 10m\ sec.$$

$$V_c = V_{max}\left[1 - e^{-t/\tau}\right] = E\left[1 - e^{-t/10m}\right]$$
$$V_c = 30V\left(1 - e^{-t/10m}\right)$$

$$i_c = I_{max}\, e^{-t/\tau} = \frac{E}{R_1 + R_2}\, e^{-t/10m\,sec} = \frac{30V}{5k}\, e^{-t/10m\,sa.}$$

$$i_c = 6mA\, e^{-t/10m\,se.}$$

$$V_{R_1} = i_c \times R_1 = 6mA\, e^{-t/10m\,se} \times 3k$$
$$V_{R_1} = 18V\, e^{-t/10m\,sec.}$$

(b) In class Tut 6   Q.3

V_C, V_{R_1}, i_C

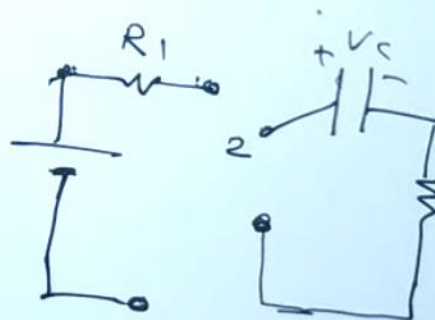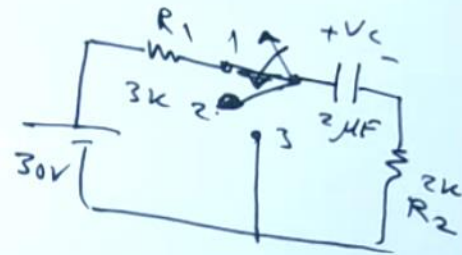$t = 100\, msec.$ more than 5τ

$V_{R_1} = 0$

$V_C = 30V \left\{ 1 - \bar{e}^{-t/10msec} \right\}$

$V_C = 30V$

$i_C = i_{Cmax} \bar{e}^{-t/\tau}$

$i_C = 6\, mA \; \bar{e}^{-\frac{100m}{10m}}$

$i_C \cong 0.27\, \mu A$

$$V_c = 30V$$

$$i_c = i_{c_{max}} \bar{e}^{\,t/\tau}$$

$$i_c = 6mA \, \bar{e}^{\,\frac{100m}{10m}}$$

$$i_c \cong 0.27 \mu A$$
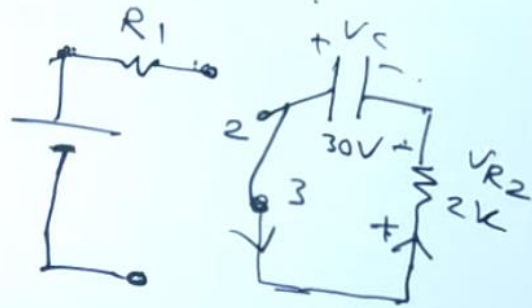
(c) $\tau_1 = 2k\Omega \times 2\mu F = 4m\,sec.$

$$V_c = V_{max} \, e^{-t/\tau}, \qquad i_c = I_{max} e^{\frac{t/\tau}{}}$$

$$V_c = 30V \, e^{-t/4msec.} \; ; \quad i_c = \frac{30V}{2k} \, e^{-t/4msec.}$$

$$V_{R_2} = - i_c \cdot 2k = - \, 15mA \, e^{-t/4msec}$$

(d)

V_C 30V

i_C 6mA

100 nsec. ①

200 msec. ②

300 msec. → t ③

60 msec   200   30   t

−15mA