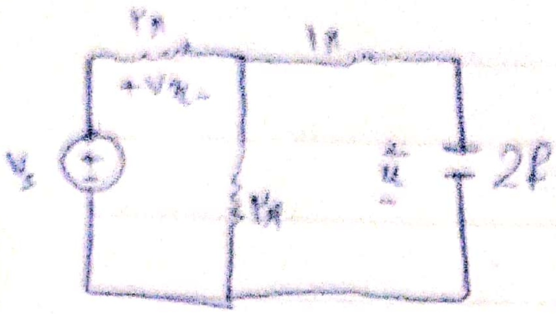
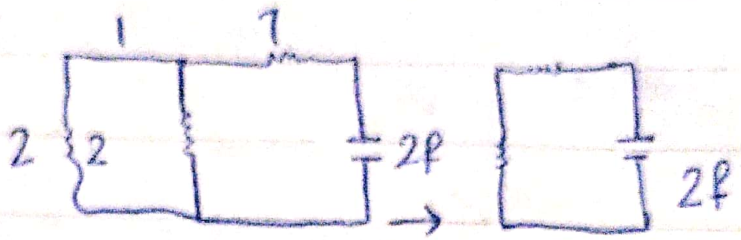
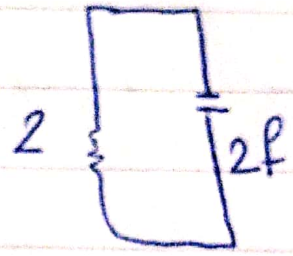
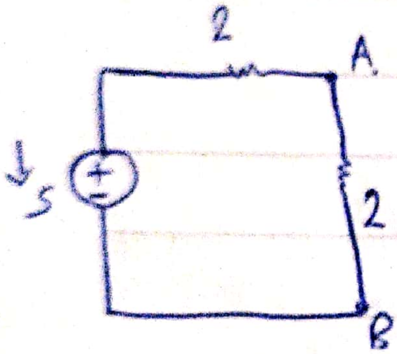


۱- چون مدار RC است پس $\tau = RC = 2n$

$\tau = 4s$







ولتاژ خازن

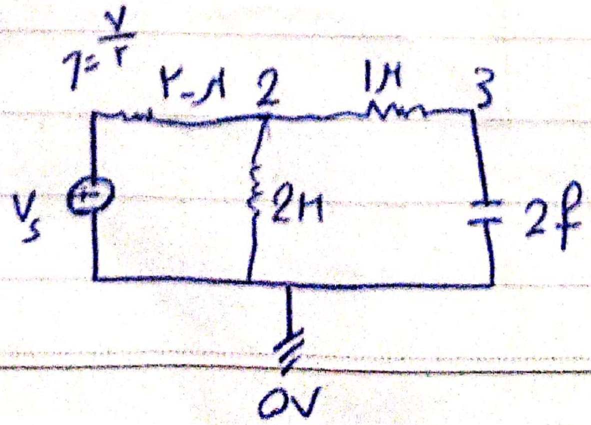
$v_C = v_{AB} = \frac{v_s}{2}$

$v_C(t) = \frac{v_s}{2} - \frac{v_s}{2} e^{-\frac{t}{4}}$

لحظه $t=0$ ← صفر در نظر گرفتیم.

$i_A = C\frac{dv_C(t)}{dt} = 2 \times \left(\frac{1}{4} \times \frac{1}{2} v_s e^{-\frac{t}{4}}\right) = \frac{v_s}{4} e$

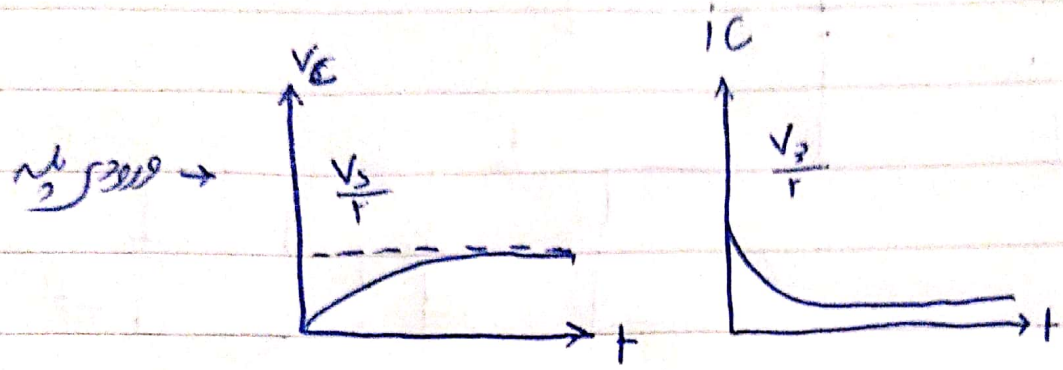
ورودی پله →



$KCL \rightarrow \frac{v_2 - v_s}{2} + \frac{v_2}{2} +$

$\frac{v_2 - v_3}{2} = 0$

$V_2 - \frac{V_s}{2} + iC = 0$ $\frac{V}{2}$.



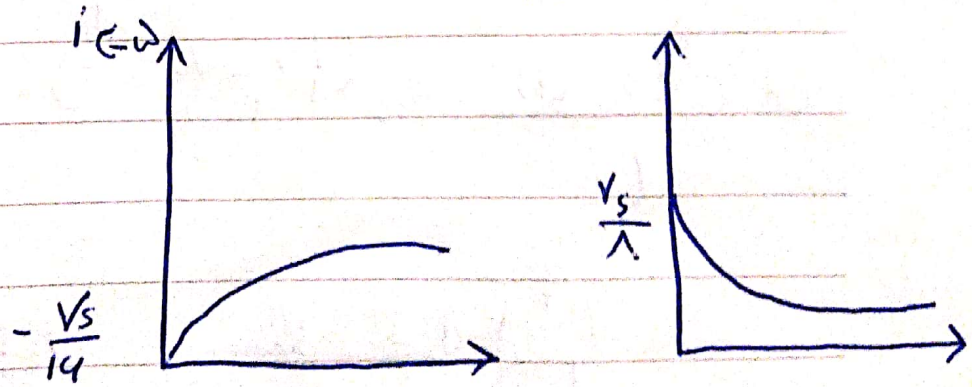
$V_2 = \frac{V_s}{2} - iC$ $V_R = V_s - V_2 = \frac{V_s}{2} + iC$

$V_{C-\Lambda}(t) = \frac{d Hc(t)}{d(t)} = \frac{V_s}{\Lambda} e^{\frac{-t}{\tau}}$

$V_{R-\Lambda} = V_s - V_2 = \frac{V_s}{2} + iC_{-\Lambda} =$

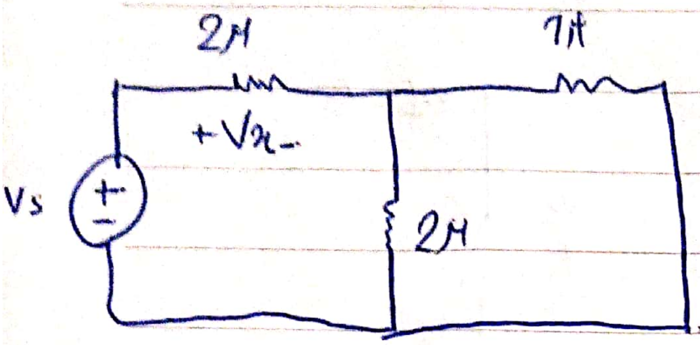
$i_{C-\Lambda}(t) = \frac{d i(t)}{dt} = -\frac{N_s}{16} e^{\frac{-t}{\tau}}$

$\frac{V_s}{2} \bullet - \frac{V_s}{14} e$



NOTE BOOK Subject: Date: / /

جریان اولیه مساوی صفر — جریان نهایی از طریق اتصال کوتاه حساب میشه



$R = \frac{2\times1}{3} + ۲ = \frac{۸}{۳}$ $I = \frac{V_s}{R_t} = \frac{3}{۸}V_s$

جریان مقاومت $i_{1\Omega} = \frac{3V_s}{۸} \times \frac{2}{3} = \frac{V_s}{۴}$

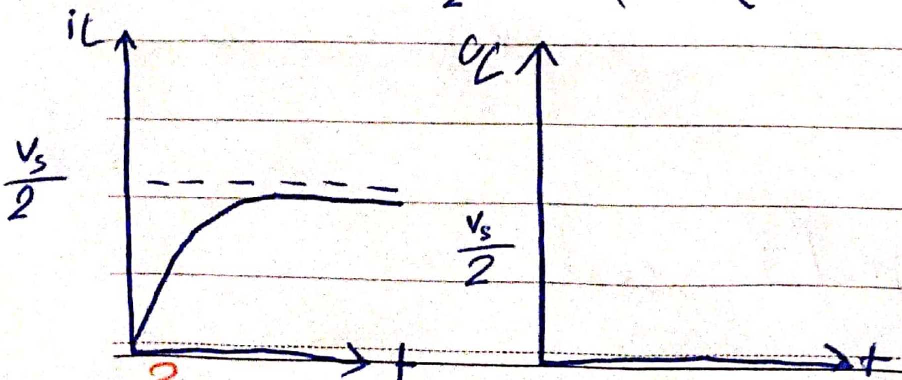
$t \to \infty$ اتصال کوتاه

ورودی پله

$I(t) = \frac{V_s}{۴} - \frac{V_s}{۴} e$ $1 = \frac{2}{2} = 1 = \frac{R}{L} = \tau$

$v_L(t) = L \frac{d\, i_L(t)}{dt} = L \frac{V_s}{۴} e = \frac{V_s}{2} e^{-t}$

$v_x = \frac{V_s}{2} + i_L = \frac{V_s}{2} + \frac{V_s}{۴} - \frac{V_s}{۴} e^{-t} = \frac{3V_s}{۴} - \frac{V_s}{۴} e^{-t}$



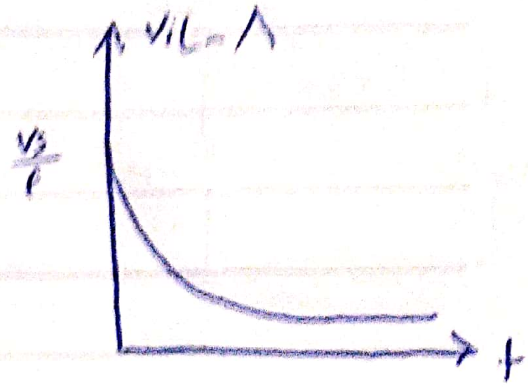
Golha

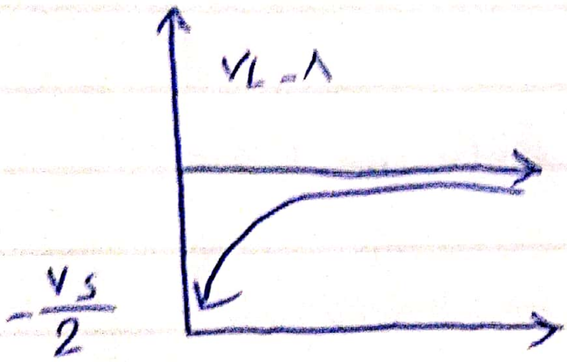
مدار ترتیب

$$I_{L-8} = \frac{dI}{dt} = \frac{V_s}{4} e^{-t} \qquad V_{L-8} = \frac{V_s}{2} e^{-t}$$

$$V_{R-8} = \frac{V_s}{2} + I_{L-8} \cdot \frac{V_s}{2} + \frac{V_s}{4} e^{-t}$$

$$\frac{3V_s}{4} e^{-t}$$





خروجی ← جریان خازن ورودی پله (V_s) ولتاژ خازن ورودی

ضریب مشتق اول مشتق $V(t)$

$i_C(t) = C V'_{R-8}(t)$ ضریب C

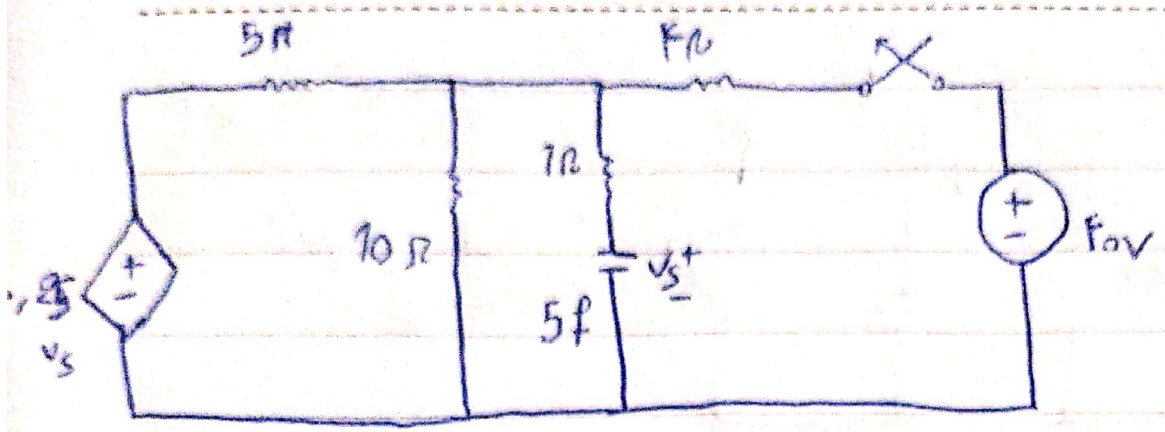
ولتاژ سلف با ورودی پله (V_s) جریان سلف با ولتاژ ضربه

ضریب L

$i_L(t)$ مرتبه مشتق $V_L(t) = L\, i'_{L-8}(t)$

NOTE BOOK Subject: Date: / /

-2



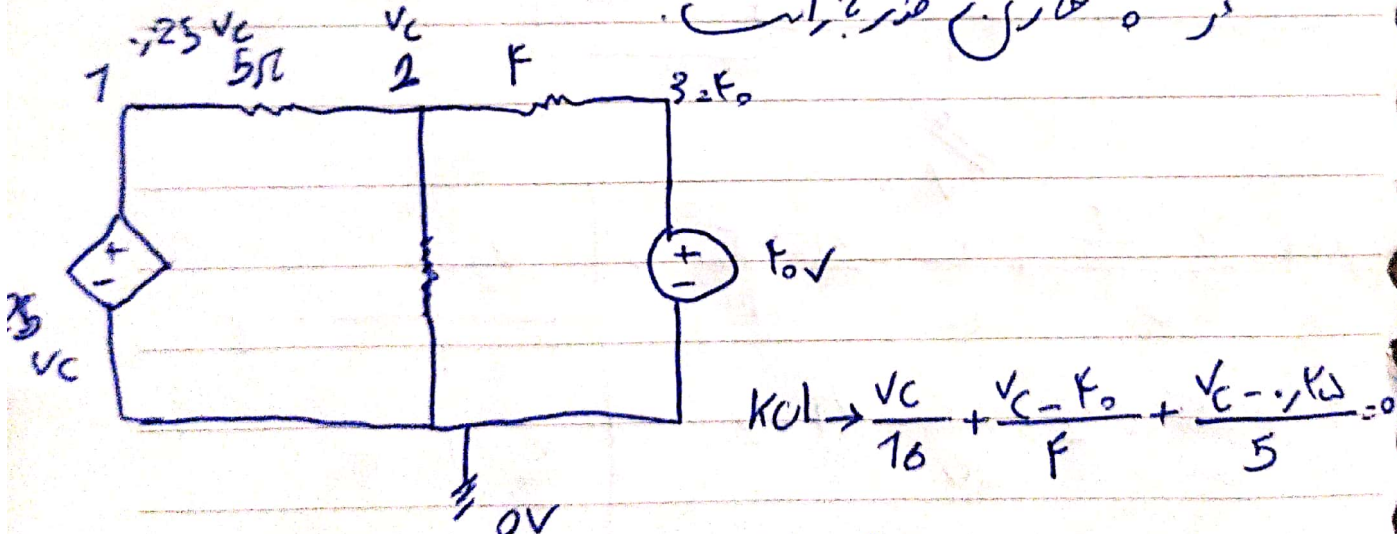
$v_c(t)$ حالت اولیه مدار: ولتاژ

$t > 0$

$t > t_0 = 0$ خازن در $t = 0^+$

$v_c(0^+) = v_c(0^-)$ چون ولتاژ خازن ناگهانی تغییر نمی‌کند

در $t = 0^+$ خازن مدار باز است.



$$KCL \rightarrow \frac{v_c}{16} + \frac{v_c - 40}{4} + \frac{v_c - 0.25v_c}{5} = 0$$

$$\frac{v_c}{16} + \frac{v_c}{4} - 10 + 0.15v_c = 0$$

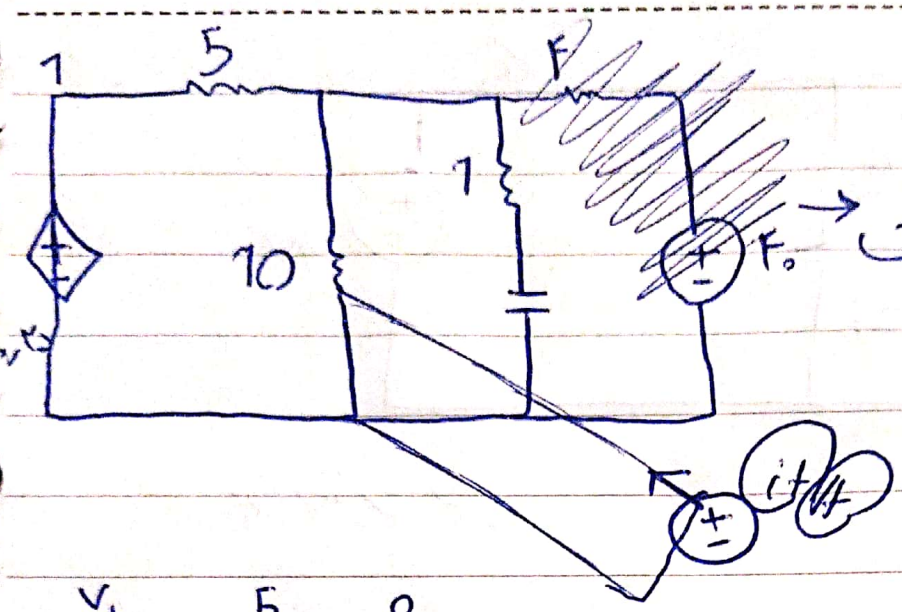
$$(0.1 + 1.25 + 0.15)v_c = 10$$

$$0.5v_c = 5 \quad v_c = 20$$

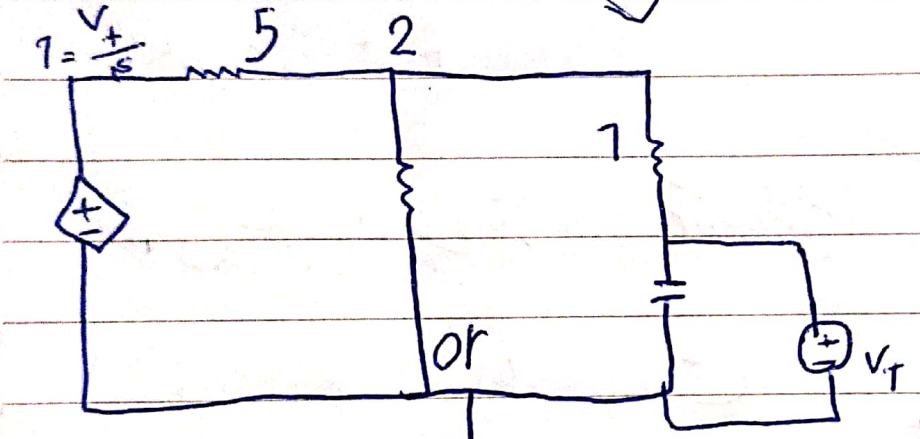
Golha

صـ 5

مدار در حالت $t>0$



مدل منبع مستقل است



$V=0$

$$KCL=\frac{V_2-\frac{V_T}{2}}{4}+\frac{V_T}{10}+\frac{V_2-V_T}{1}=0$$

$$\frac{V_T}{8}+\frac{V_T}{10}+V_2-\frac{V_T}{20}-V_T=0$$

$$V_2\left(\frac{13}{16}\right)=V_T\left(\frac{21}{20}\right)$$

$$V_2\left(\frac{84}{21}\right)=\frac{V_T}{4}\quad V_2=\frac{21}{84}V_T$$

$$\frac{5}{84}V_T=-i_T$$

$$\frac{V_2-V_3}{1}=i_T$$

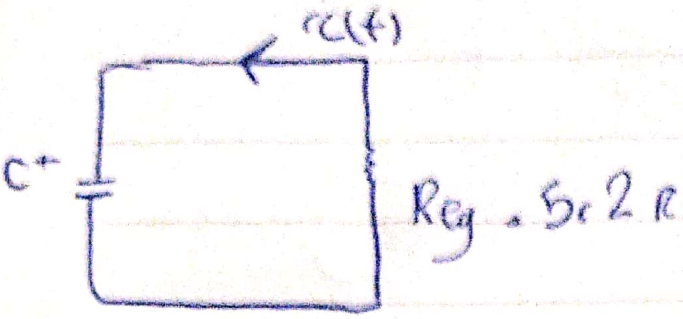
$$V_2-V_T=i_t$$

$$V_2=V_T+i_T$$

$$V_t+i_t=\frac{21}{26}V_t$$

$$-5.2i_t=V_T$$

$$R_{eq}=5.2\,\Omega$$



$$v_c(t) + R_{eq}\, i_c(t) = 0$$

$$i(t) = C\frac{dv_c(t)}{dt} \Rightarrow$$

$$v_c(t) + 5.2 \times 5\frac{dv_c(t)}{dt} = 0$$

$$v_c(t) + r_4\frac{dv_c t}{dt} = 0 \Rightarrow r_4\frac{dv_c t}{v_c t} = -dt$$

$$r_4 \ln(f(t+1)) = -t + q$$

$$v_c(t) = ke$$

$$v_c(6) = 20$$

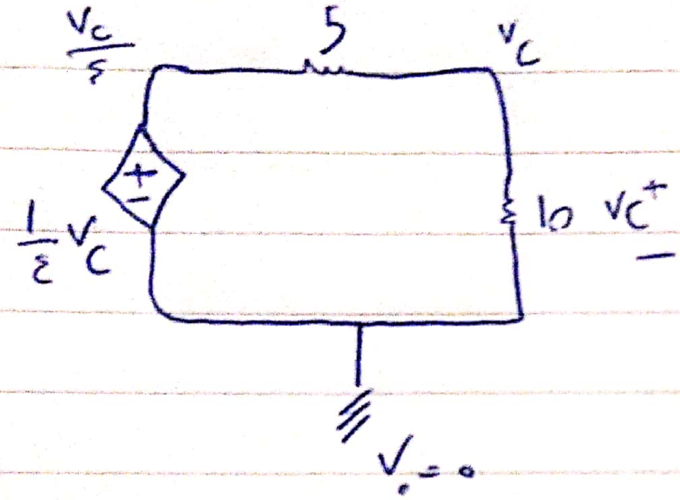
$$k = 20$$

$$v(t) = 20\,\frac{-t}{r_4}$$

Golha

Scanned with CamScanner

$v_C(t) = v_C(\infty) + \left[v_C(0^+) - v_C(\infty)\right] e^{-\frac{t}{\tau}}$ ($v_C(\infty)$ crossed out, replaced by 0)



د اتصال کوتاه

$$\frac{v_C - 0}{10} + \frac{v_C - \frac{v_C}{2}}{5} = 0$$

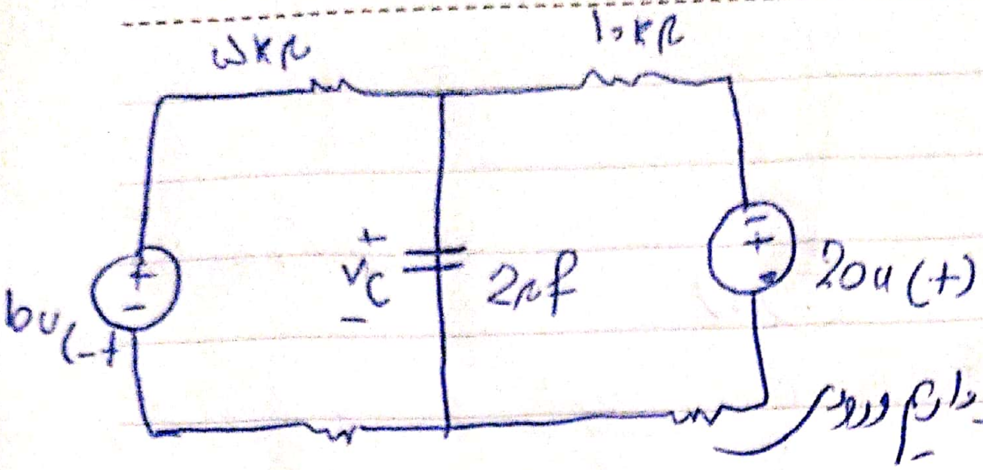
$$\frac{v_C}{10} + \frac{3}{20} v_C = 0$$

$$v_C(t) = 0 + (20 - 0)e^{-\frac{t}{\tau}} = 20e^{-\frac{t}{\tau}}$$

RC مدار $\quad \tau = RC = R_{eq} \times 5 = 5.2 \times 5 = 26$

$$v_C = 20e^{\frac{-t}{26}}$$

(3)

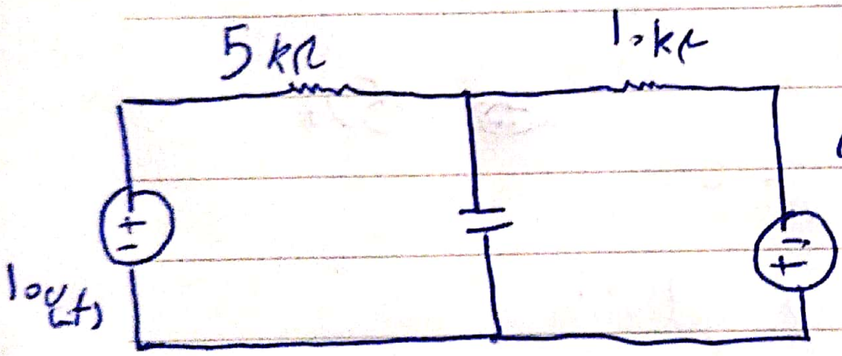


حالت ابتدایی

ولتاژ ($t=0^+$) را نیاز داریم ورودی

پله است و V_c تغییرات ناگهانی نمی‌کند.

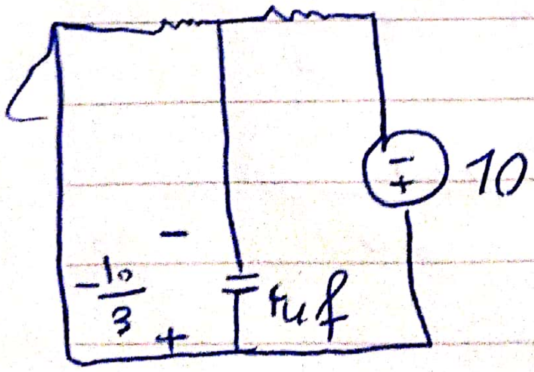
$v_c(0^+) = v_c(0^-)$



در $t<0$ چون پله و شیب صفر

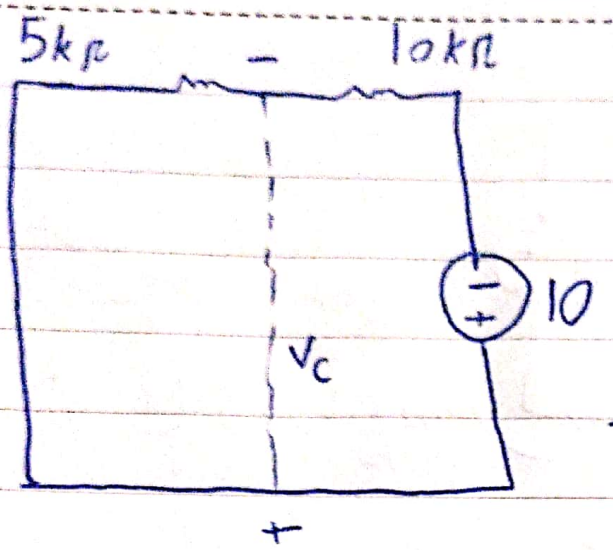
برعکس میشه (علامت)

(−) ولتاژ اولیه خازن $-\frac{10}{3}V$ است.



$R_{eq} = \frac{5\times10}{5+3}$

$R_{eq} = \frac{10}{3}\,k\Omega$



$C = R_{eq} C =$

$\frac{10}{3} \times 10^3 \times 2 \times 10^{-6} =$

$\frac{2}{3} \times 10^{-2}$ s $\rightsquigarrow \frac{-300t}{2}$

$V_C(t) = \frac{10}{3} - \frac{20}{3} e^{-150t}$

$V_C(t) = \frac{10}{3} - \frac{20}{3} e^{-150t}$

$V_C(t) = 0 \quad \frac{10}{3} - \frac{20}{3} e^{-150t}$ ← $-150t$

$2 = e^{150t}$

$\frac{\ln 2}{150} = t$

$V_C = t = \frac{10}{3} \quad \frac{10}{3} - \frac{20}{3} e^{\frac{-300}{2} t} - \frac{10}{3}$

$\frac{-300}{2} t$ — زمان تثبیت $= 5\tau = 5 \times \frac{1}{300} =$

$t = \infty$

$e^{-\infty} = 0$ $\frac{2}{60} = \frac{1}{30}$ s