بالشین

رضا دیندوز
۹۸۱۴۳۰۳
تمرین سری ۴ بالس

3-9

555 ic
$V_{cc} = 18^{V}$
$PW = 0.5^{ms}$

$i_{c,min} \gg I_{th,max} \xrightarrow{I_{th,max} = 0.25^{\mu A}}$

$i_{c,min} = 100\, I_{th,max} = 100\,(0.25^{\mu A}) = 25\,\mu A$

$$R_A = \frac{V_{cc}}{3 i_{c,min}} = \frac{18}{3 \times 25^{\mu A}} = 240^{K} \xrightarrow{\text{استاندارد}} R_A = 200^{K}$$

$$C_A = \frac{T}{R_A \ln 3} = \frac{0.5^{ms}}{200^{K} \ln 3} = 2275 \xrightarrow{\text{استاندارد}} C_A = 2200^{PF}$$

7-9

$PRF = 5^{K}$
$D.C = 75\%$
$V_{cc} = 15^{V}$

$I_{th} = 0.25^{\mu A}$
$I_{Trig} = 0.5^{\mu A}$

$\Rightarrow i_{c,min} \gg I_{th} \Rightarrow i_{c,min} = 1^{mA}$

$$R_A + R_B = \frac{V_{cc}}{3 i_{c,min}} = \frac{15}{3 \times 1^{m}} = 5^{K}, \quad f = 5^{KHZ}, \quad T = \frac{1}{f} = \frac{1}{5^{K}} = 200^{\mu S}$$

$$T_1 = 0.75\,T = 0.75\,(200^{\mu S}) = 150^{\mu S}, \quad T_2 = 0.25\,T = 0.25\,(200^{\mu S}) = 50^{\mu S}$$

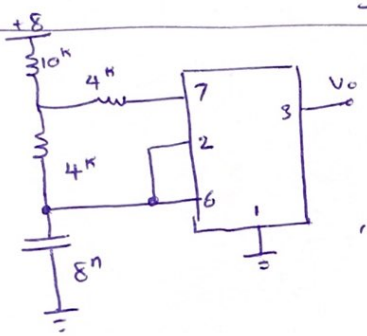
$T_1 = (R_A + R_B) C_A \ln 2 \Rightarrow C_A = \frac{T_1}{(R_A+R_B)\ln 2} = \frac{150^{\mu s}}{5^{k} \times \ln 2} = 43^{nF}$

استاندارد $\rightarrow C_A = 47^{nF}$

$T_2 = R_B C_A \ln 2 \Rightarrow R_B = \frac{T_2}{C_A \ln 2} = \frac{50^{\mu s}}{47^{nF} \times \ln 2} = 1.53^{k}$ استاندارد $\rightarrow R_B = 1.5^{k}$

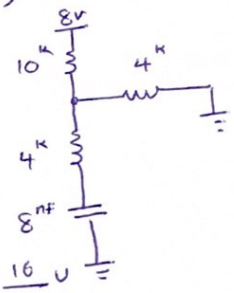
$R_A = 5^{k} - R_B = 3.5^{k}$ استاندارد $\rightarrow R_A = 3.6^{k\Omega}$

9-9



$t_1 = (10^{k} + 4^{k}) \times 8^{nF} \times \ln 2 = 77.6^{\mu s}$

با فرض به اشباع رفتن ترانزیستور،



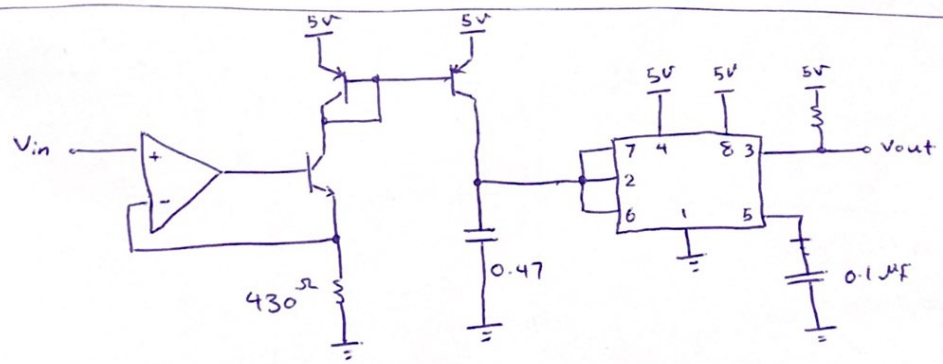
$V_c(0^+) = \frac{2}{3} V_{cc} = \frac{16}{3} V$, $V_c(\infty) = \frac{4^{k}}{10^{k} + 4^{k}} \times 8 = \frac{16}{7} V$

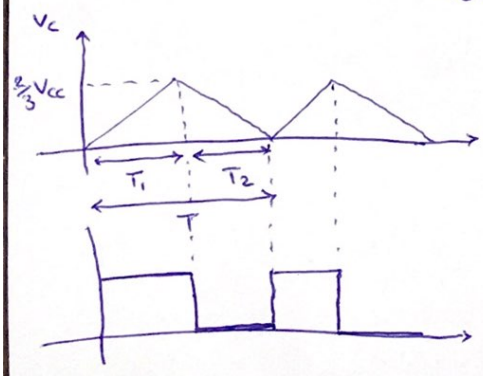
$V_c(t) = \frac{16}{7} + \left[\frac{16}{3} - \frac{16}{7}\right] e^{-\frac{t}{\tau}} = 16\left(\frac{1}{7} + \frac{4}{21} e^{-\frac{t}{\tau}}\right)$

$\tau = \left[(4^{k} \| 10^{k}) + 4^{k}\right] 8^{nF} = 54.86^{\mu s} \Rightarrow \frac{8}{3} = 16\left[\frac{1}{7} + \frac{4}{21} e^{-\frac{t_2}{\tau}}\right]$

$t_2 = \tau \ln 8 = 54.86^{\mu s} \times 2.079 = 114^{\mu s}$

15-9





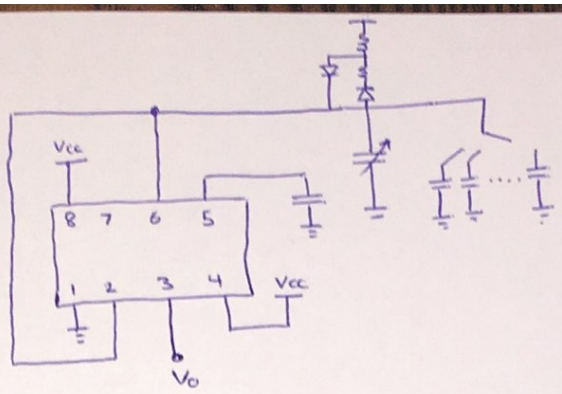
$I_c = C \frac{\Delta V}{\Delta t}$ $\Delta t = T_1 \rightarrow I_1 = \frac{V_{in}}{430}$, $\Delta V = \frac{2}{3} V_{cc} = \frac{10}{3}$

$\Delta t = T_1$ با فرض ثابت بودن زمان شارژ و دشارژ $\rightarrow f = \frac{1}{T}$

$\frac{V_{in}}{430} = 0.47^{\mu F} \times \frac{10/3}{\frac{1}{f}} \Rightarrow f = 1.48\, V_{in}^{(KHz)}$

#17-9

$$\begin{cases} V_o = 10^{V} \\ f_o = 1^{KHz} - 10^{KHz} \\ V_o < 1^{V} \end{cases}$$



$T_1 = R_A C_A \ln 2$, $T_2 = R_B C_A \ln 2$

$T = T_1 + T_2 = (R_A + R_B) C_A \ln 2$

$$f = \frac{1}{T} = \frac{1}{(R_A+R_B) C_A \ln 2} \Rightarrow D.C = \frac{T_1}{T_1+T_2} = \frac{R_A C_A \ln 2}{(R_A+R_B) C_A \ln 2} = \frac{R_A}{R_A+R_B} = 0.6$$

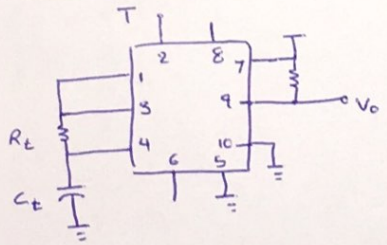
$$R_A = 1.5 R_B \xrightarrow{\text{if } i_{c,min} = 1^{mA}} R_A = \frac{V_{cc}}{3 i_{c,min}} = \frac{V_o + 1}{3 i_{c,min}} = \frac{11}{3 \times 1} = 3.67^{K}$$

$\xrightarrow{\text{استاندارد}} R_A = 3.6^{K} \Rightarrow R_B = \frac{R_A}{1.5^{K}} = \frac{3.6^{K}}{1.5^{K}} = 2.4^{K}$

$$f = \frac{1}{(R_A+R_B) C_A \ln 2} = \frac{1}{(3.6^{K} + 2.4^{K}) C_A \cdot 0.69} = \frac{1}{4.14 C_A} \Rightarrow 1^{KHz} \le f \le 10^{K}$$

$$1000 \le \frac{1}{4.14 C_A} \le 10000 \Rightarrow 0.024^{\mu F} \le C_A \le 0.24^{\mu F}$$

#28-9



فرض $R_t = 22^{K}$:

$$\Rightarrow T = R_t C_t \Rightarrow C_t = \frac{T}{R_t} = \frac{0.5^{ms}}{22^{K}} = 22727^{PF}$$

$\xrightarrow{\text{استاندارد}}$ $C_t = 22000^{PF}$