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(22.8

$I_C = 100\alpha I_L = 100 \times 50\mu A = 2mA$

$R_C = \frac{V_{CC} - V_{CE(sat)}}{I_C} = \frac{I_0}{5mA} = 2K\Omega$

$I_B \geq \frac{I_C}{\beta(min)} = \frac{5}{100} = 50\mu A$ $\frac{V_{CC} - V_{BE(ON)}}{R_{13}} = \frac{10 - 0.7}{R_B} \Rightarrow 50\mu A$

$R_B = 270\,k\Omega$ $t_1 = t_2 = 0.5T = \frac{0.5}{f} = \frac{0.5}{5kHz} = 100\mu s$

$C = \frac{t_1}{0.69 R_B} = \frac{100\mu s}{0.69 \times 270k\Omega} = 537\,pF$

(34

$I_C = 100 I = 100 \times 50\mu A = 5mA$

$Q_1(sat) : V_{CC} = R_{C_1} I_{C_1} + V_{CE(sat)} + R_{E_1} I_{E_1}$

$V_{13} = V_{BE(ON)} + R_{E_1} I_{E_1}$

$Q_2(sat) : V_{CC} = R_{C_1} I_{B_1} + V_{BE(ON)} + R_{E_2} I_{E_2}$

if $I_C = I_E = 5$ $V_{CE(sat)} = 0.2$ $R_{E_1} = R_{E_2}$

$V_{BE} = 0.7$

$R_{C_1} + R_E = 1.76$

$V_{13} - 5R_E = 0.7$ $100 R_E + R_{C_1} = 166$

$R_E = 1.6$ $R_{C_1} = R_{C_2} = 150$ $V_B = 8.7$

$T_2 = R_{E_2} C \ln\left(\frac{V_{CC} - 2V_{BE}}{(V_B - V_{BE}) + V_{CE(sat)}}\right) \rightarrow 100 = 1.6\left(\frac{2 - 2\alpha 0.7}{\ln 8.7 - 0.7 + 2}\right)$

s.a.m

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37) الف) خروجی در اشباع مثبت ← $v_o^+ = 3{,}3 + {,}7 = 4$ خازن c ← شارژ توسط R ← 4

$$UTP = \frac{R_g}{R_g + R_f} v_o^+ = \frac{4}{3} v$$

$$v_o^- = -(6{,}3 + {,}7) = -7$$ پس از ولتاژ خازن از تراز بالاتر رفتن ولتاژ خازن

← خروجی اشباع منفی

خازن c ← توسط R دشارژ ← $LTP = \frac{R_g}{R_g + R_f} v_o^- = -\frac{7}{3}$

زمان شارژ ← $v(0^+) = -\frac{7}{3} v$

$, v(\infty) = 4 \qquad RC = \tau$

$$v^-(t) = 4 + \left(-\frac{7}{3} v - 4\right) e^{-\frac{t}{RC}} = 4 - \frac{19}{3} e^{-\frac{t}{RC}} v$$

$$\frac{4}{3} = 4 - \frac{19}{3} e^{-t/RC} \qquad T_1 = {,}86 RC$$

$$v^-(t) = -7 + \left(\frac{4}{3} - (-7)\right) e^{-\frac{t}{RC}} = -7 + \frac{25}{3} e^{-\frac{t}{RC}} v$$

$$-\frac{7}{3} = -7 + \frac{25}{3} e^{-T_2/RC}$$

$T_2 = {,}58 RC$

$$T = T_1 + T_2 = {,}865 RC + {,}6 RC = 1{,}445 RC$$

$$f = \frac{1}{T} = \frac{1}{1{,}445 RC} = 1 \qquad RC = 692$$

R_2

ب)

$$\text{duty cycle} \Rightarrow \frac{T_1}{T_1 + T_2} \times 100 = \frac{{,}865 RC}{1{,}445 RC} \times 100 = 60\%$$

s.a.m

4001193 مرتضی جعفری

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(4.

$v_o(0^+) = v_{th}$ $\quad v_o(\infty) = v_{oH}$ $\quad \tau = RC$

$v_o(t) = v_{oH} + (v_{tl} - v_{oH}) e^{-\frac{t}{RC}}$

$v_o(t) = v_{tu}$

$v_{tu} = v_{oH} + (v_{tl} - v_{oH}) e^{-T_1/RC}$

$$T_1 = RC \ln\left(\frac{v_{tl} - v_{oH}}{v_{tu} - v_{oH}}\right) = RC \ln \frac{v_{oH} - v_{tl}}{v_{oH} - v_{tu}}$$

$v_o(0^+) = v_{tu}$, $v_o(\infty) = V_{oL}$, $\tau = RC$

$v_o(t) = v_{oL} + (v_{tu} - v_{oL}) e^{-\frac{t}{RC}}$

$v_o(t) = v_{tl}$ $\qquad v_{tl} = v_{oL} + (v_{tu} - v_{oL}) e^{-T_2/RC}$

$$\longrightarrow T_2 = RC \ln\left(\frac{v_{tu} - v_{oL}}{v_{tl} - v_{o}}\right)$$

$$T = T_1 + T_2 = RC\left(\ln \frac{v_{tu} - v_{oL}}{v_{tl} - v_{oL}} + \ln \frac{v_{oH} - v_{tl}}{v_{oH} - v_{tu}}\right)$$

48) نقطه B ← منطق یک
نقطه A ← منطق صفر

نقطه 3 ← $R_S I G_1$ ، ولتاژ نقطه A در اثر اتصال خازن
شارژ می‌شود تا ولتاژ نقطه A به V_T

$V_C = V_T + R_S I G_1$

$V_A(0^+) = V_T + R_S I G_1 + V_{CC}$

ولتاژ نقطه به صفر میل کند ← $R \| R_S$
به اندازه V_{CC} نزولی ← C ← V_T
کاهش می‌یابد

s.a.m