یا علی

رضا دیبایی

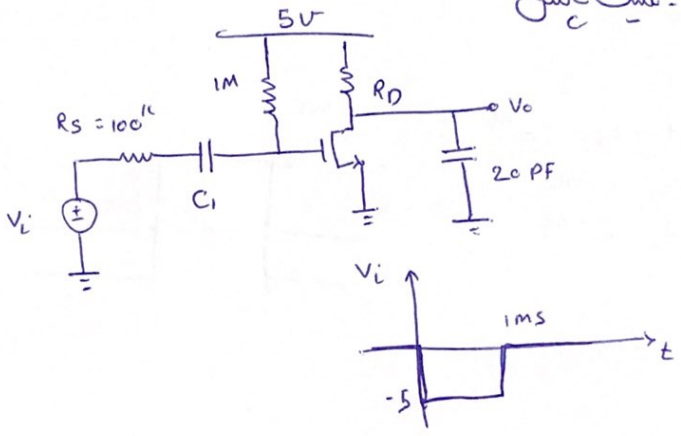
۹۸۱۴۳۰۳

امتحان اول - تکنیک پالس

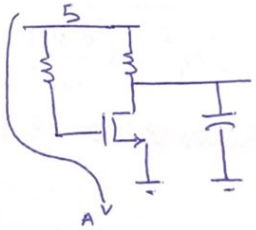
#2

$K = 1 \ \frac{mA}{V^2}$

$V_t = 2\ V$



for $t<0$: $V_i = 0$



KVL in A: $-5 + 1^{M} I_G + V_{GS} = 0$

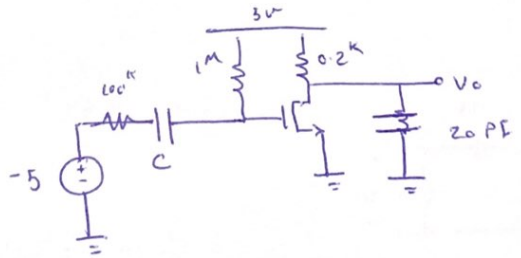
$V_{GS} = 5\ V > V_t$

$\Rightarrow$ با فرض اینکه ترانزیستور در اشباع است : $I_D = K(V_{GS} - V_t)^2 = 1(5-2)^2 = 9^{mA}$

$\Rightarrow V_{DS} = 5 - R_D I_D < 5 - R_D(9^{mA}) > \underbrace{V_{GS} - V_{th}}_{=3}$

$5 - 9^{mA} R_D > 3 \Rightarrow 2 > 9R_D \Rightarrow R_D < \frac{2}{9}^{K\Omega} = 0.2^{K}$

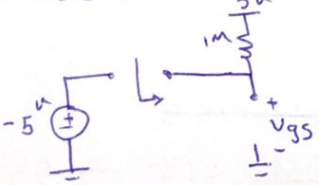
ب) for $0 < t < 1^{ms}$



$V_{GS}(0^+) = V_C(0^+) + (-5)$

$V_C(0^+) = V_C(0^-) = 0 \Rightarrow V_{GS}(0^+) = -5\ V < V_t \longrightarrow$ ترانزیستور خاموش می شود

$\Rightarrow$



$V_{GS}(\infty) = 5V$

$V_{GS}(t) = V_{GS}(\infty) + (V_{GS}(0^+) - V_{GS}(\infty))\, e^{\frac{-t}{\tau}}$

$V_{GS}(t) = 5 + (-5-5)\, e^{\frac{-t}{\tau}} = 5 + (-10)\, e^{\frac{-t}{\tau}}$

$\tau = 1^{M} \times C$

$$\Rightarrow V_{gs}(t) = 5 - 10e^{\frac{-t}{1M \cdot C}} \xrightarrow[V_{gs} = -0.5]{\text{با شرط}} -0.5 = 5 - 10e^{\frac{-t}{1M C}} \xrightarrow{t = 1ms}$$

$$-0.5 = 5 - 10e^{-\frac{1\times10^{-3}}{1\times10^{6} C}} \Rightarrow C = ?$$

یا لطیف

رضا ادیب پور
۹۸۱۴۳۰۳
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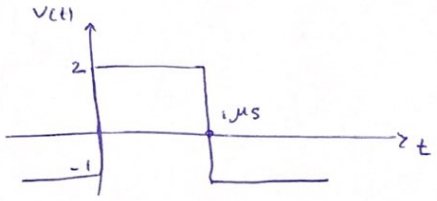
#1

$$\begin{cases} t_{r_i} = t_{f_i} = 50\ ns \\ f_H = 5\ MHz \\ f_L = 10\ KHz \end{cases}$$



a) t_{ro} , t_{fo} = ?
% tilt = ?

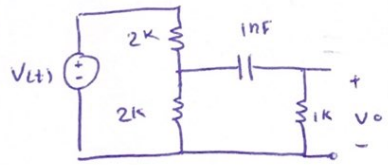
$$t_{ro} = \sqrt{t_{r_i}^2 + \left(\frac{0.35}{f_H}\right)^2} = \sqrt{(50\times10^{-9})^2 + \left(\frac{0.35}{5\times10^6}\right)^2}$$

$$\approx 8.60\times10^{-8} = 86\ ns$$

$$\%\ tilt = \pi \frac{f_L}{f_{in}}$$

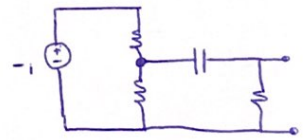
$$f_{in} = \frac{1}{T} =$$

b)



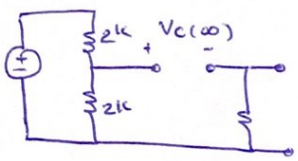
$V_o(0^-) = 0$

for $t<0$:

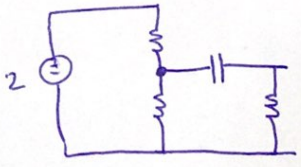


$V_c(0^-) = V_c(\infty) \Rightarrow$

$V_c(0^-) = \frac{2(-1)}{4} = \frac{-2}{4} = -0.5V$



for $t>0$



~~$V_c(0^-) = V_c(0^+) = -0.5V$~~ برش دائمه

$V_c(0^+) = \frac{2(2)}{4} = 1V \rightarrow \Delta V = 1V$

$\Rightarrow V_o(\infty) = 1V$

$\Rightarrow \tau = RC$:

$\equiv$

$\tau = (2^K \| 2^K) + 1^K = 2^K \Rightarrow \tau = 2^K * 1^{nF} = 2^{\mu s}$

$v_o(t) = v_o(\infty) + [v_o(0^+) - v_o(\infty)] e^{-\frac{t}{\tau}}$

$= 1 + (0 - 1) e^{-\frac{t}{2\mu s}}$