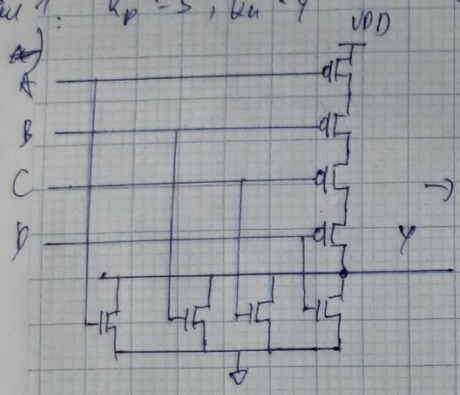
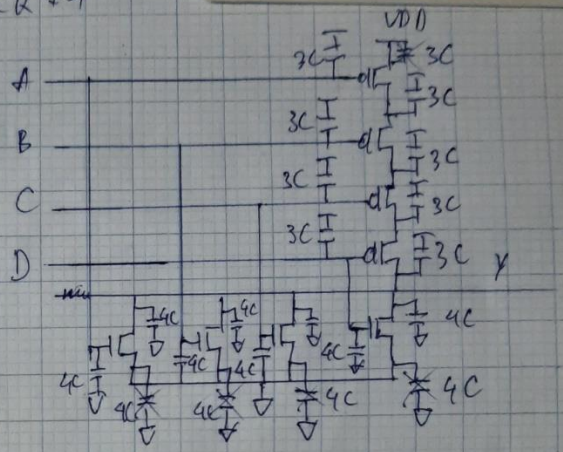
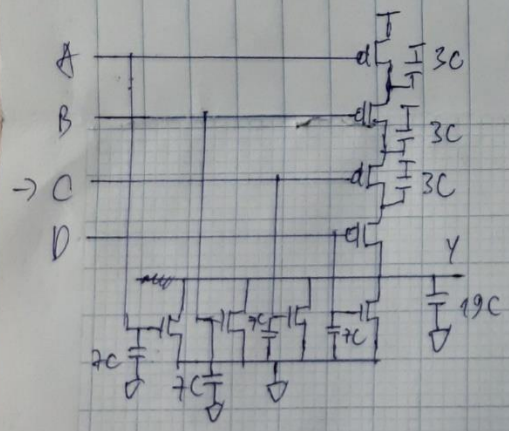
Họ tên: Phan Công Danh
MSSV : 19119160
Chữ kí: Dê

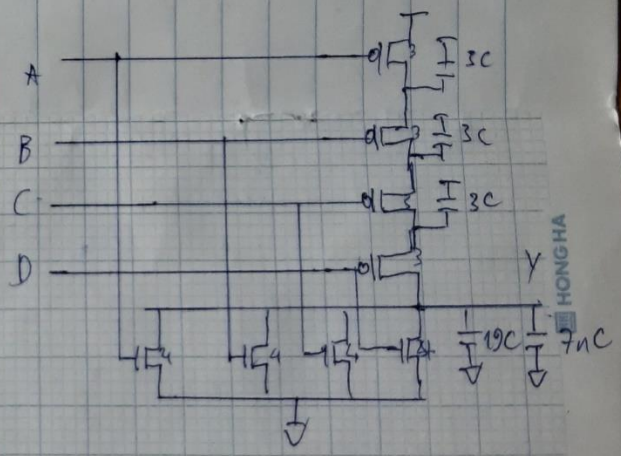
kiểm tra cần thi CK ≠ 1

Câu 1: $k_p = 3$, $k_n = 9$

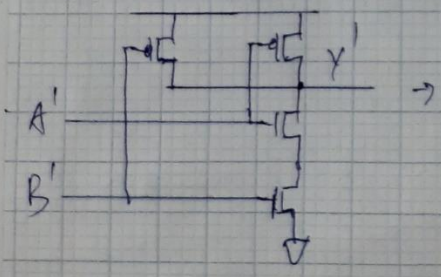


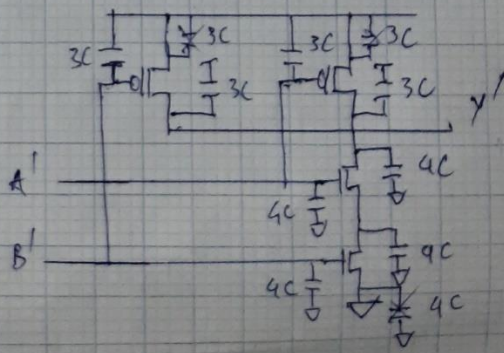






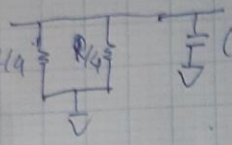
Cổng NAND 2 ngõ vào:





Họ tên: Phan Công Danh
MSSV: 19119160
Chữ ký: Đã

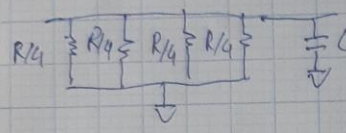
a) $A=1, B=0, C=1, D=0 \rightarrow Y=0$



$\rightarrow R_{tđ} = \frac{R/4 \cdot R/4}{R/4 + R/4} = \frac{R}{8}$

$\Rightarrow t_{pdf} = \frac{R}{8}(19+7n)C$

b) $A=0, B=1, C=1, D=1 \Rightarrow Y=0$

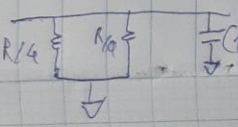


$\rightarrow \frac{1}{R_{tđ}} = \frac{1}{R/4} + \frac{1}{R/4} + \frac{1}{R/4} + \frac{1}{R/4} = \frac{16}{R}$

$\rightarrow R_{tđ} = R/16$

$\Rightarrow t_{pdf} = \frac{R}{16}(19+7n)C.$

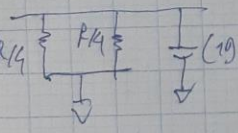
c) $A=0, B=1, C=1, D=0 \Rightarrow Y=0$



$\rightarrow R_{tđ} = \frac{R/4 \cdot R/4}{R/4 + R/4} = \frac{R}{8}$

$\Rightarrow t_{pdf} = \frac{R}{8}.(19+7n)C$

d) $A=0, B=1, C=0, D=1 \Rightarrow Y=0$



$\rightarrow R_{tđ} = \frac{R/4 \cdot R/4}{R/4 + R/4} = \frac{R}{8}$

$\Rightarrow t_{pdf} = \frac{R}{8}.(19+7n)C$

Câu 2:

a) $t_{ox} = 60\text{Å}$, $1\text{Å} = 10^{-8}\text{cm}$, $\mu = 300\text{cm}^2/\text{V.s}$, $\varepsilon = 3,9\varepsilon_0$, $\varepsilon_0 = 8,85.10^{-14}\text{F/cm}$, $V_t = 0,9\text{V}$

$\beta = \mu . C_{ox} . \frac{W}{L} = \mu . \frac{\varepsilon}{t_{ox}} . \frac{W}{L} = 300 . \frac{(3,9.8,85.10^{-14})}{60.10^{-8}} . \frac{4}{2} = 345,15\ \mu\text{A/V}^2$

b) Tacó $V_{gs} \geq V_t$ ($1,5\text{V} > 0,9\text{V}$) $\rightarrow V_{dsat} = 1,5 - 0,9 = 1,1\text{V}$

$\Rightarrow I_{ds} = \frac{\beta}{2}(V_{gs} - V_t)^2$ ($V_{ds} > V_{dsat}$)

$= \frac{345,15}{2}(1,5-0,9)^2$

$= 208,815\ \mu\text{A}$

Khi $V_{ds} < V_{dsat}$:

$I_{ds} = \beta\left(V_{gs} - V_t - \frac{V_{ds}}{2}\right).V_{ds}$