Q1)

a) From the $1000°$ dry curve in the figure, it takes $2.5\,h$ to grow $0.1\,\mu m$ of oxide.

b) In this part, use the $900°C$ wet curve only. First, we determine that it would've taken $0.7\,h$ to grow the $0.1\,\mu m$ oxide at $900°C$.

$2.4\,h$ to grow $0.3\,\mu m$

$2.4 - 0.7 = 1.7\,h$ in wet

Ans. $1.7\,h$.

Q2)

i) $f = [a\cdot b + a\cdot c + b\cdot d]$

de morgan thm

$f = a\cdot b + a\cdot c + b\cdot d = \bar{a}\cdot\bar{b}\cdot\bar{a}\cdot\bar{c}\cdot\bar{b}\cdot\bar{d}$

~~QQQ~~

ii) $f = (a+b)\cdot(a+c)\cdot(b+d)$

Ans => already simplified.

iii) simplify.

$f = [a + b\cdot c]'$

* de morgans law,

$f = \bar{a}\cdot b\cdot c = \bar{a}\cdot(\bar{b}+\bar{c})$

iv) Ans => Buffer explanation

The buffer simply duplicates the input.

v) Ans = XOR explanation

This is the XOR gate expn

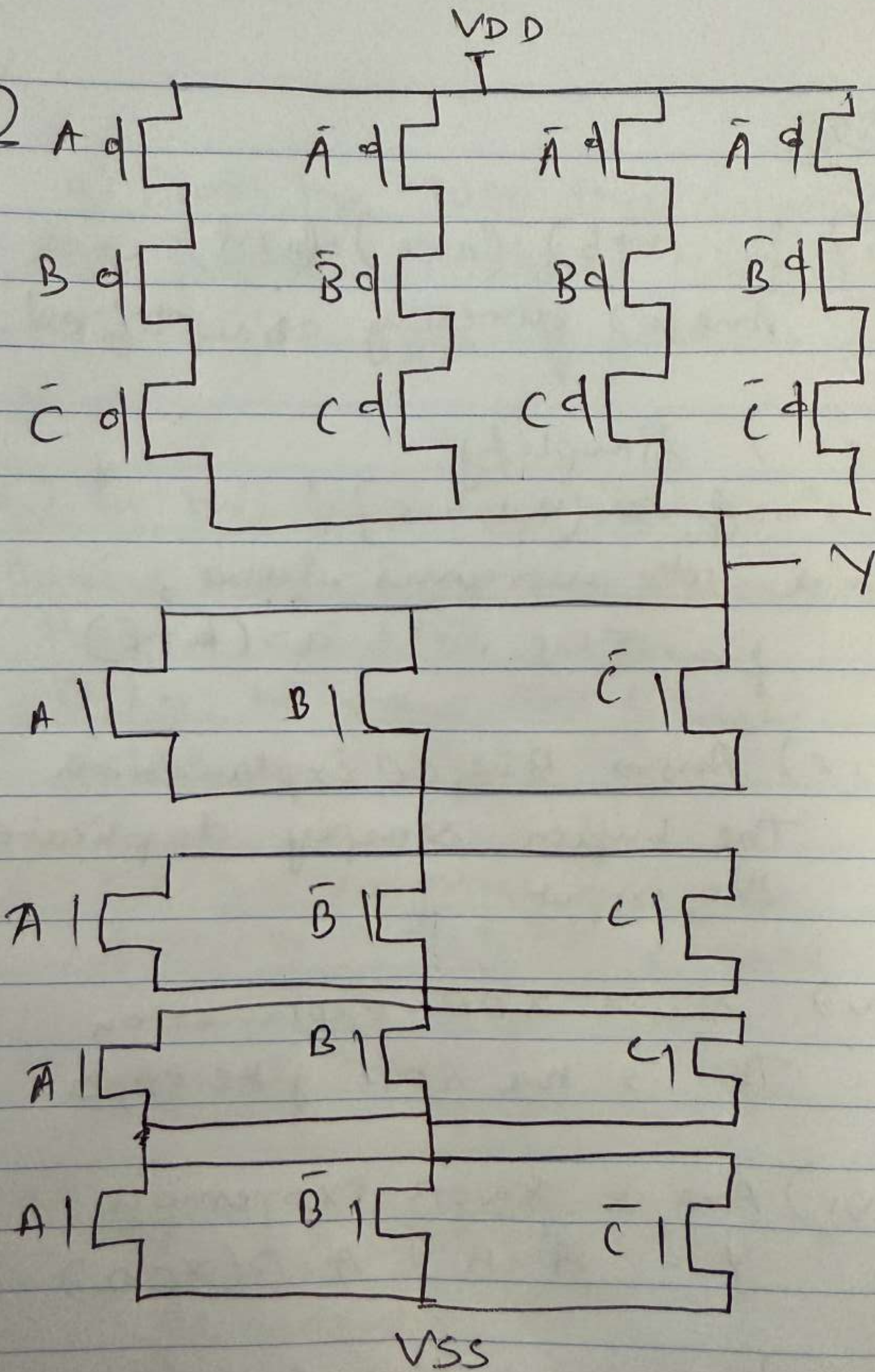
vi) Ans = XNOR expression

$Y = A'\cdot B' + A\cdot B$ (XOR)

vii) $A\cdot B + B\cdot C + A\cdot C$ (Majority fn)

The fn yeilds true when atleast two of three inputs are valid

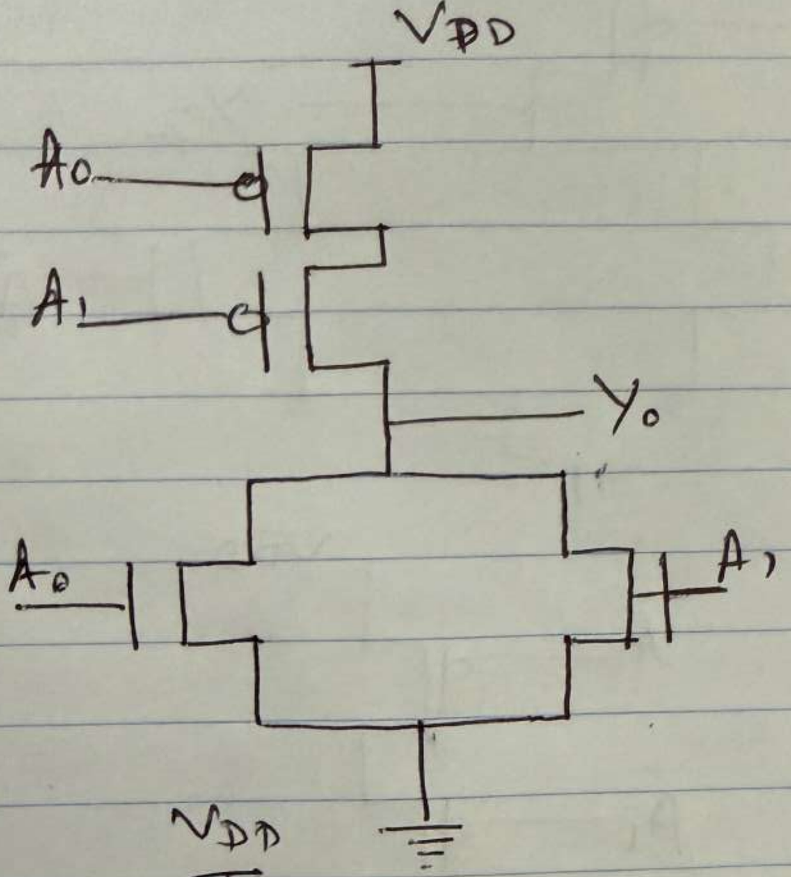
Q3)


VDD
A
B
$\bar{C}$
$\bar{A}$
$\bar{B}$
C
$\bar{A}$
B
C
$\bar{A}$
$\bar{B}$
$\bar{C}$
Y
A
B
$\bar{C}$
$\bar{A}$
$\bar{B}$
C
$\bar{A}$
B
C
A
$\bar{B}$
$\bar{C}$
VSS

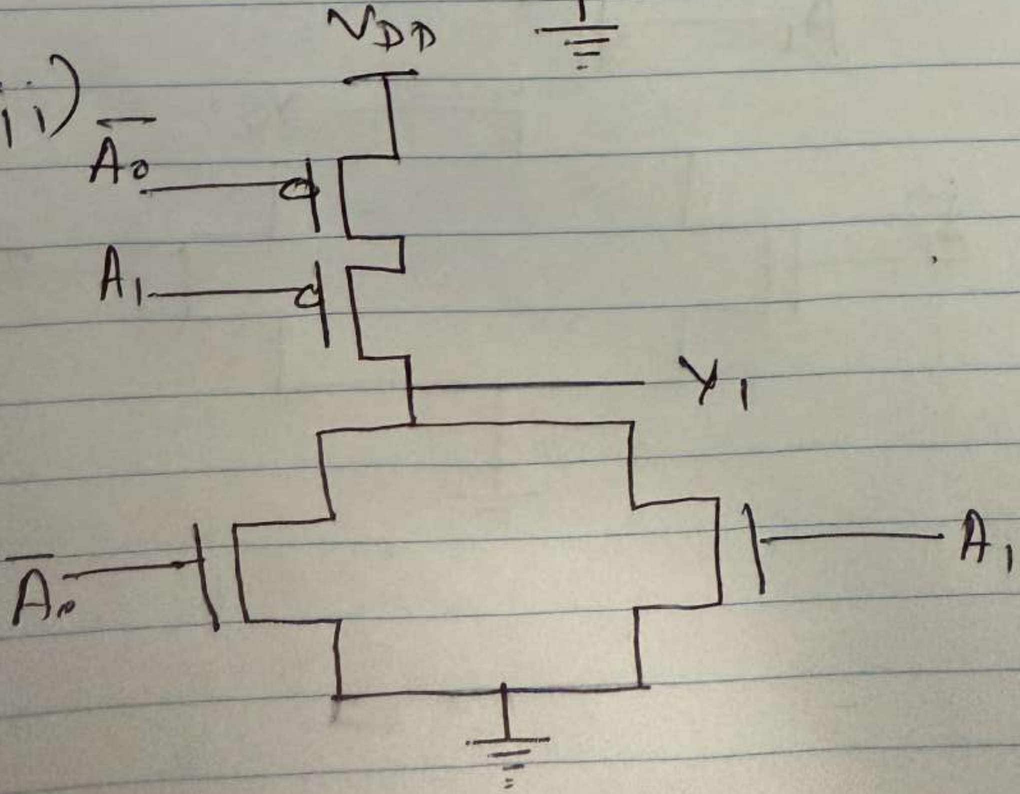
Q4)

i) $Y_0 = \overline{A_0} \cdot \overline{A_1}$

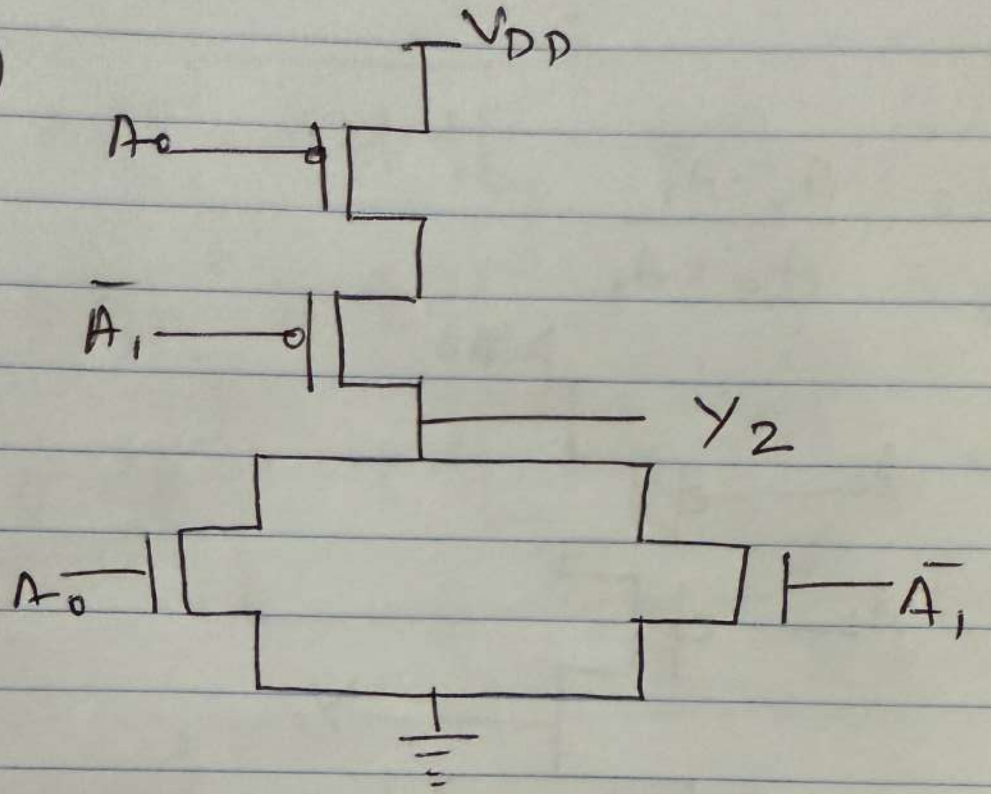
$Y_0 = \overline{A_0 + A_1}$



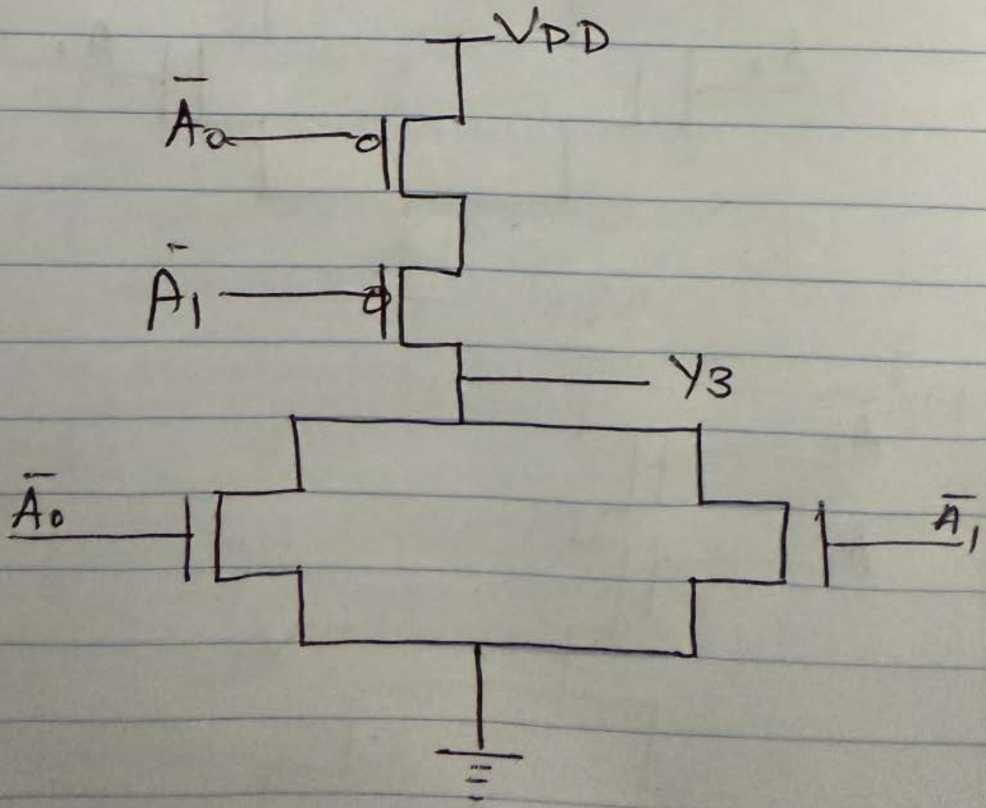
ii)



iii)



iv)



Q5)

A	B	$\overline{A \cdot B}$	$\overline{A + B}$
0	0	1	1
0	1	1	0
1	0	1	0
1	1	0	0

a)

$\cancel{F = \overline{ABCD} + E}$

Ans = $\bar{F} = ABCD + E$

b)

$F = (\bar{A} + \bar{B} + \bar{C} + \bar{D})\bar{E}$

Q6)

$$V_f = \frac{C_s \cdot V_{max} + C_{BL} \cdot V_{BL}}{C_s + C_{BL}}$$

$$V_f = \frac{10fF \cdot 1V + 50fF \cdot 0.5V}{60fF}$$

$$= \frac{10 + 25}{60} = 0.5833\ V$$

Vothage threshold for logic 1
BL drives logic 1 if V is $0 \cdot V_{DD}$ >>

$$V_{th} = 0.5 + 0.1 = 0.6V$$

Leakage & Time calculation.

$$I_{leak} = I_x e^{V/V_T}$$

$$V_t = V_f \cdot e^{-t/RC}$$

whe $V(t) = 0.6V$

$$t = -RC \cdot \ln\left(\frac{0.6}{0.583}\right)$$

Assuming R is derived from leakage current.

$$R = \frac{V_f}{I_{leak}} = \frac{0.5833}{10 \times 10^{-12}}$$

putting R & $C = 60\,fF$

we get $t \approx 1.39$ seconds.