A-41

G. H. Raisoni College of Engineering Nagpur
2020-2021 ODD Term

CAE-1 Examination for Split-II Course Winter-2020
(online mode)

Department :- Electronics Engineering
Semester/Section :- VIIth / A
Date of Examination :- 13/07/2020
Subject :- CMOS VLSI Design.
Roll No. :- 41
Name :- Himanshu Dilip Gabhane
Registration No. :- 2017AETX1117103

CO.1

Q1) Define NML : Low Noise Margin & NMH : High Noise Margin

⇒

NM_L (Noise Margin low) :-

NML is defined as the difference in magnitude between the maximum LOW output voltage of the driving gate and the maximum input LOW voltage recognized by the driven gate. Thus,

NM_L (Noise Margin low) = $V_{il} - V_{ol}$.

NM_H (Noise Margin high) :-

The value of NMH is difference in magnitude between the minimum HIGH output voltage of the driving

Gabhane
13/07/2020

gate and the minimum input HIGH voltage recognized by the receiving gate. Thus,

NM$_H$ (Noise Margin high) = Voh − Vih

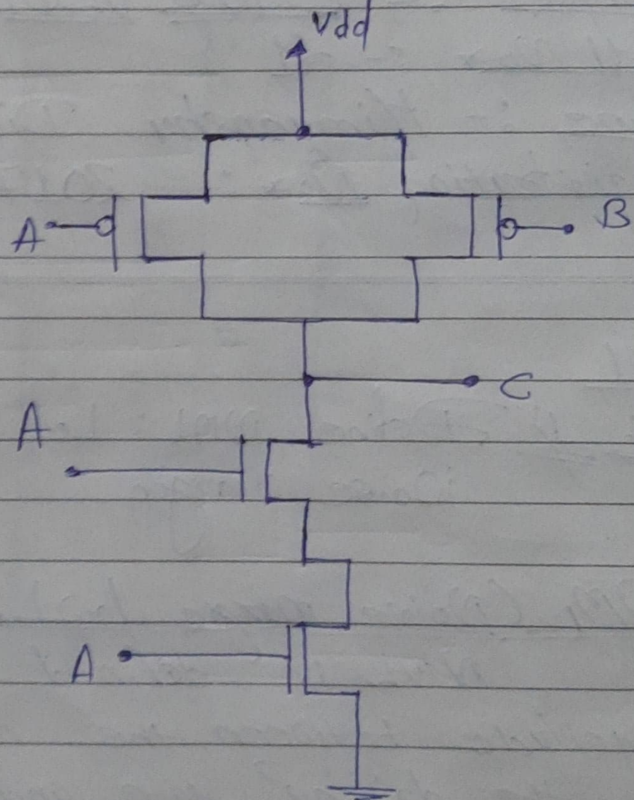
CO1

Q 2 Draw NAND Gate by using Pull up and Pull down Networks with proper truth table.

⟹

Pull Up Network

A	B	C
0	0	1
0	1	1
1	0	1
1	1	Z



Pull Down Network

A	B	C
0	0	Z
0	1	Z
1	0	Z
1	1	0

Combined CMOS Network

A	B	C
0	0	1
0	1	1
1	0	1
1	1	0

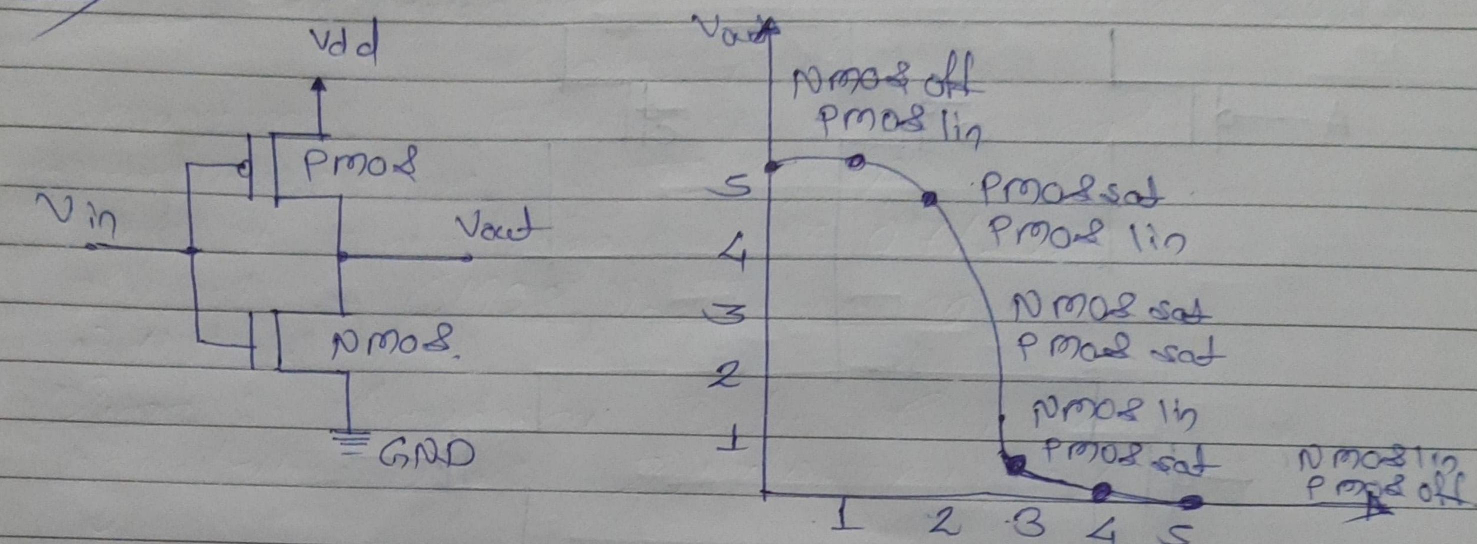
13/07/2020

2

CO.1

b) Relationship between voltages for the three regions of operation of a CMOS Inverter.

⟹



OFF: V_GateToSource < V_Threshold

Linear (or OHMIC): 0 < V_DrainToSource < V_GatetoSource − V_Threshold

Saturation: 0 < V_GateToSource − V_Threshold < V_Drain To Source

Cmos Inverter ⟶ V_GateToSource = Vin

That is for high input, the nmos transistor drives (pulls-down)

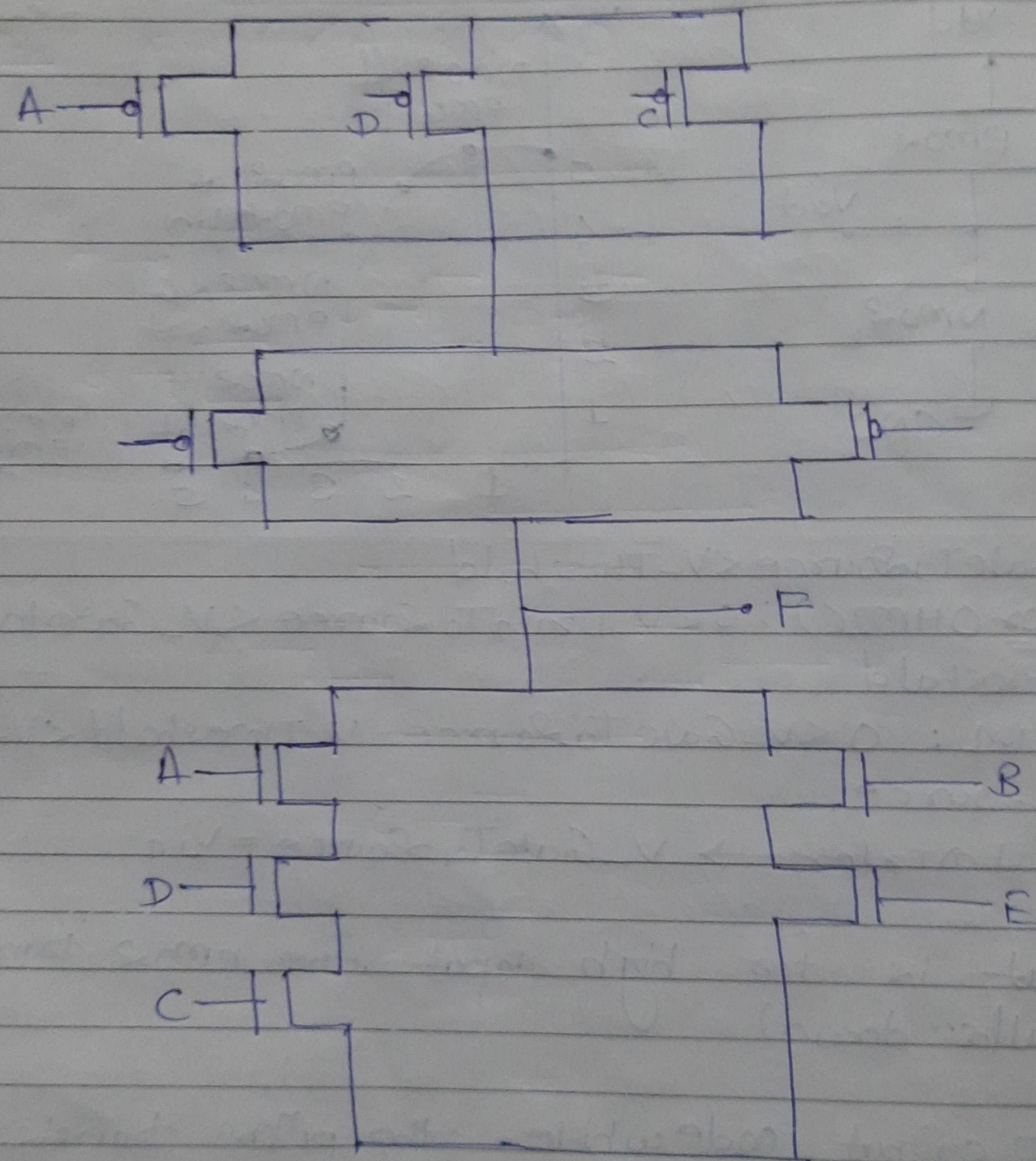
the output node while the pMos transistor acts as the load,

And for low input the pmos transistor drives (pulls up) o/p node with the nmos transistor acts as the load

13/07/2020

CO2

⇒ b) $F = (A + D + E)(B + E)$



Effective Ratio

$\left(\frac{W}{L}\right)_{eff}$ of nMOS $- \frac{1}{1}$

13/07/2020

$$\frac{1}{1} = \frac{1}{\frac{L}{W} + \frac{L}{W} + \frac{L}{W}}$$

$$\frac{1}{1} = \frac{1}{3L/W}$$

$$\boxed{n\text{mos} = \frac{W}{L} = \frac{3}{1}}$$

$$P\text{mos} = \frac{3}{1} = \left(\frac{W}{L}\right)_{\text{eff}}$$

$$= \frac{3}{1} = \frac{1}{L/W}$$

$$\boxed{P\text{mos} = W/L = 3/1}$$

~~C.O.2~~

~~Q) $F = ((A+B)(C.D))'$~~

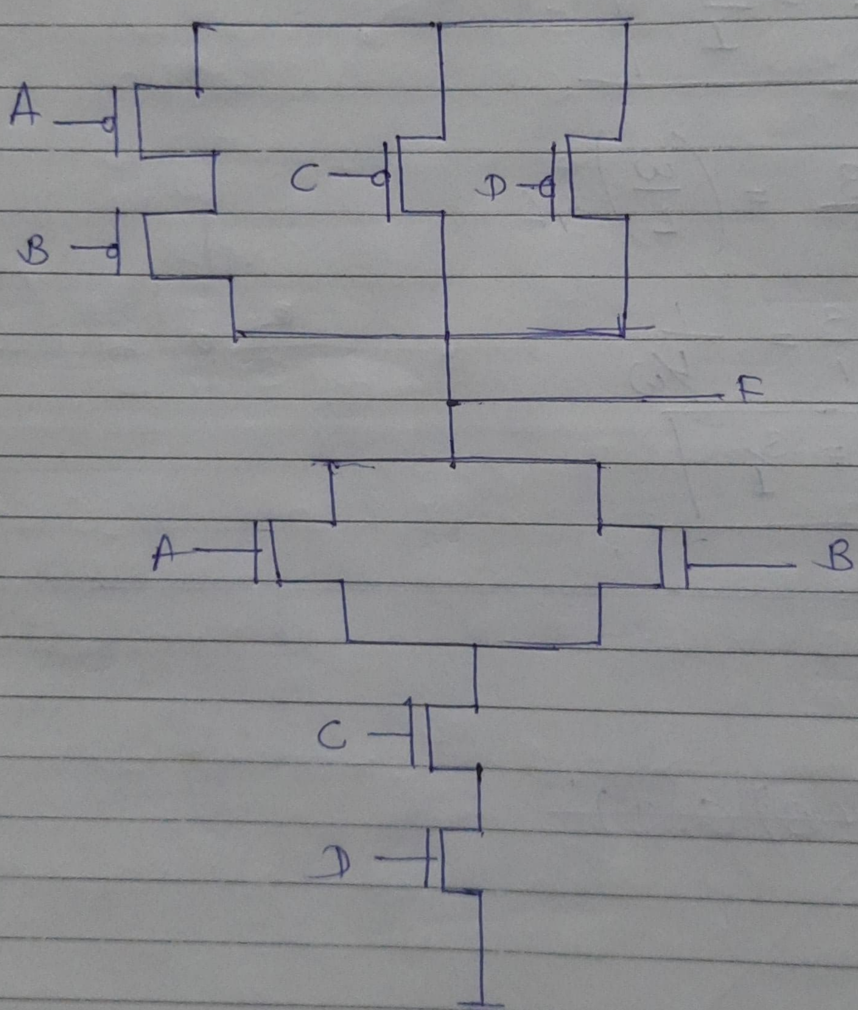
$\frac{H}{}$ Gobhone 13/07/2020 (5)

CO2

⇒ a)

$F = ((A+B)C.D)'$

i.e., $F = \overline{((A+B).C\cdot D)}$



Prathame 13/07/2020 (6)