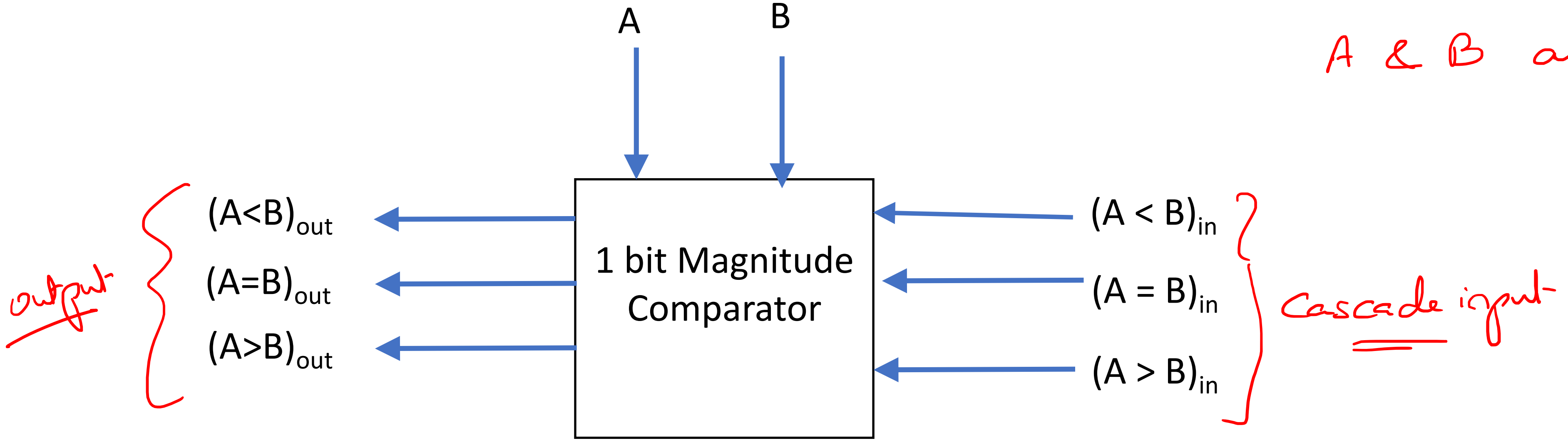
Multipliers and Magnitude comparators

• 1-bit magnitude comparator with cascading input:

A & B are inputs

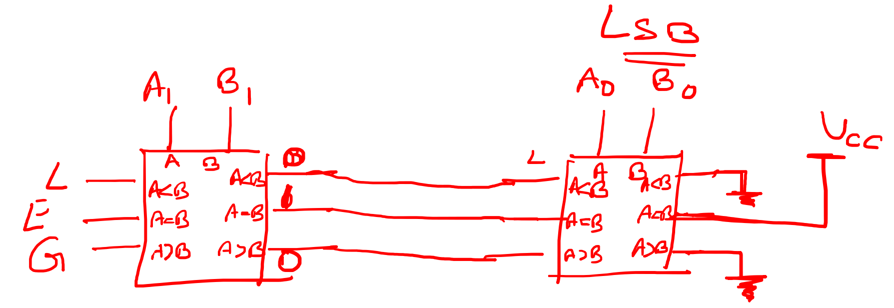


G $\quad (A>B)_{out} = (A>B) + (A=B)(A>B)_{in}$

L $\quad (A<B)_{out} = (A<B) + (A=B)\ (A<B)_{in}$

E $\quad (A=B)_{out} = (A=B)(A=B)_{in}$

Ex: Two 2-bit Numbers A & B $\quad A \Rightarrow A_1A_0 \quad B \Rightarrow B_1B_0 \qquad \begin{matrix} 1 & 1 \\ 1 & 0 \end{matrix}$



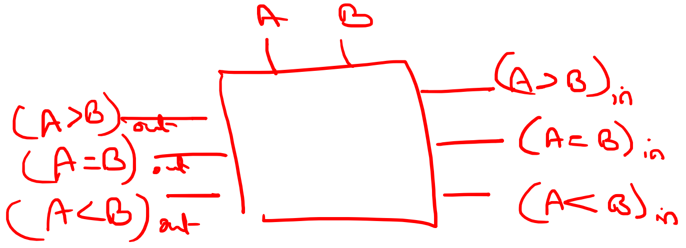
G $\quad A > B = (A_1 > B_1) + (A_1 = B_1) \cdot (A_0 > B_0) \Rightarrow G = G_1 + E_1 G_0$

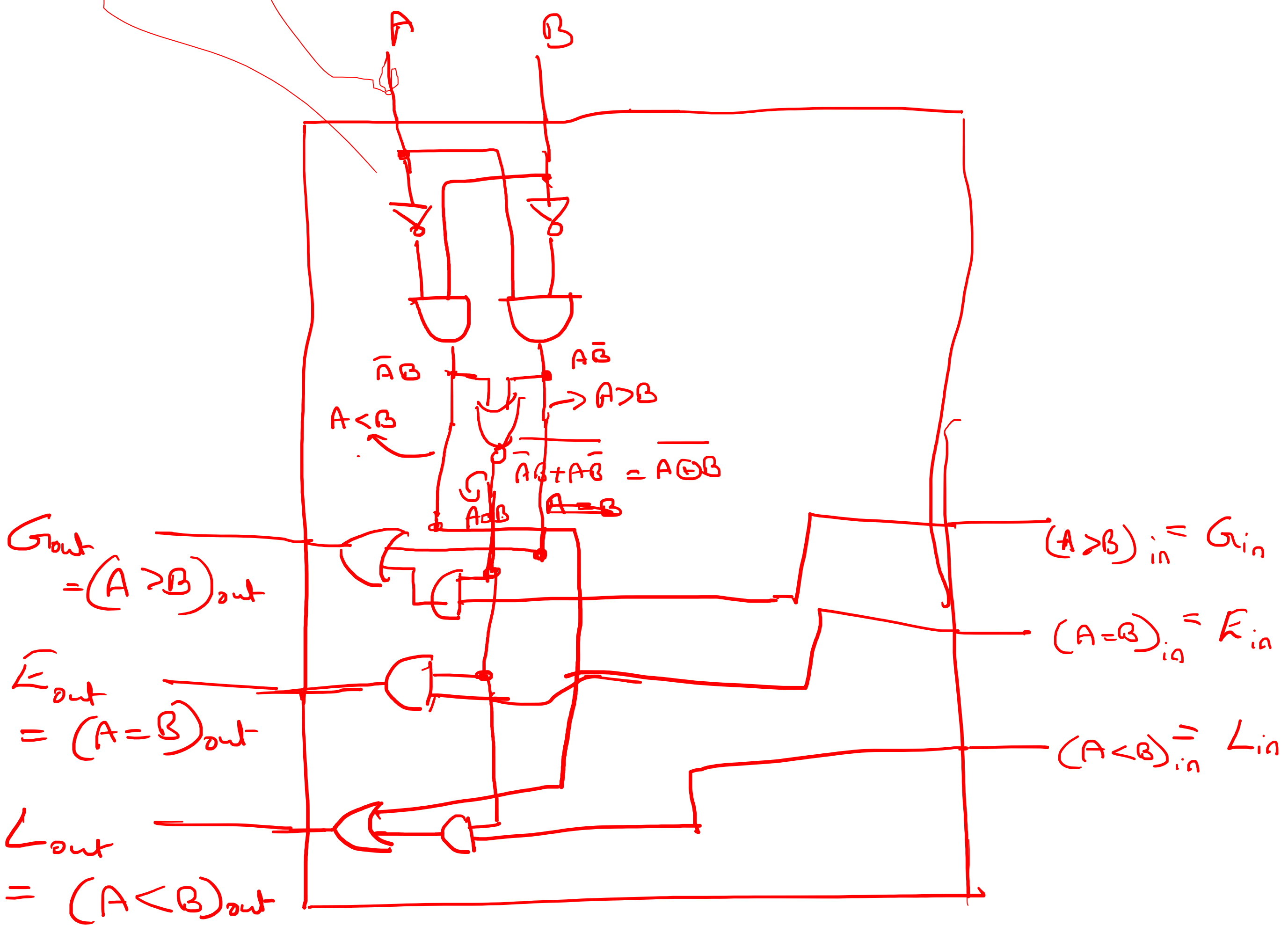
L $\quad A < B = (A_1 < B_1) + (A_1 = B_1) \cdot (A_0 < B_0) \Rightarrow L = L_1 + E_1 \cdot L_1$

E $\quad (A = B) = (A_1 = B_1) \cdot (A_0 = B_0) \Rightarrow E = E_1 \cdot E_0$

- Design of 1-bit magnitude comparator with cascading input:

$$(A>B)_{out} = (A>B) + (A=B)(A>B)_{in}$$

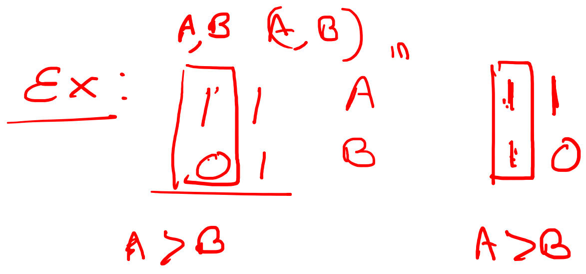




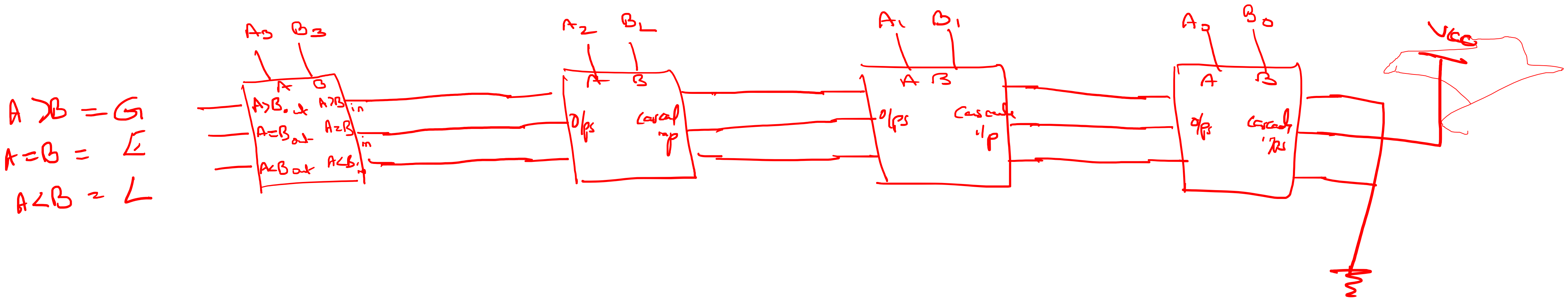
$$(A>B)_{out} = (A>B) + (A=B)(A>B)_{in}$$

$$(A=B)_{out} = (A=B)\cdot(A=B)_{in}$$

$$(A<B)_{out} = (A<B) + (A=B)(A<B)_{in}$$

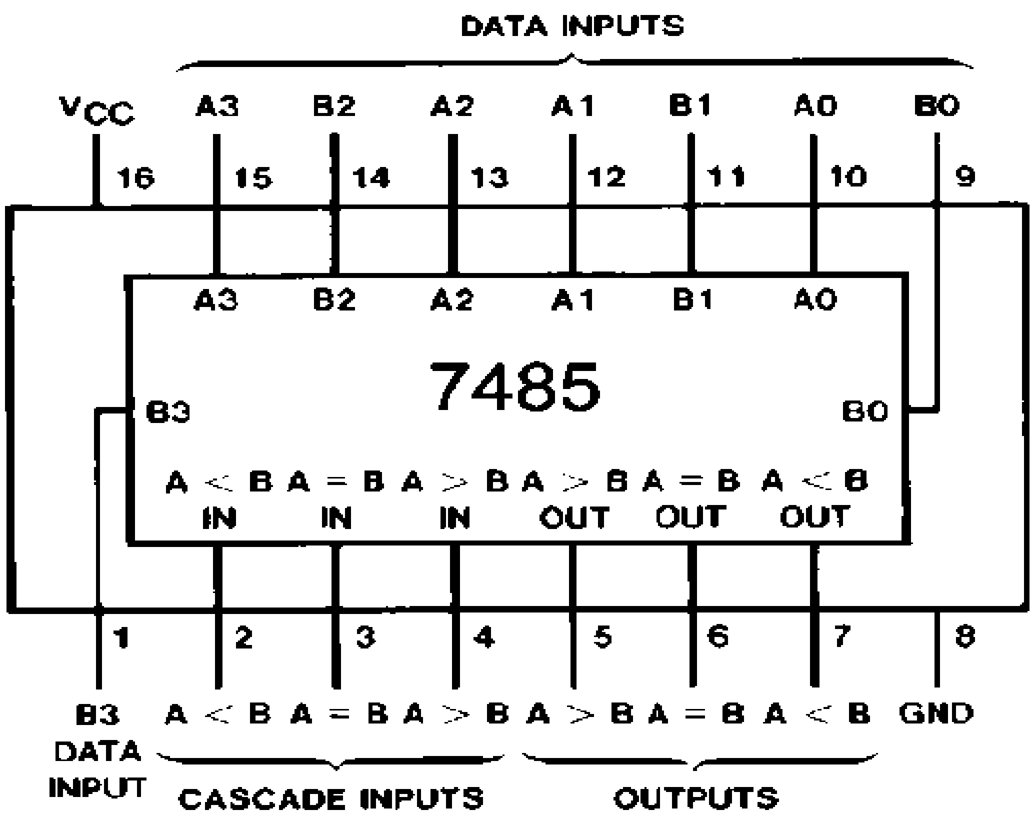


- Design a 4-bit magnitude comparator using 1-bit magnitude comparator with cascading inputs.

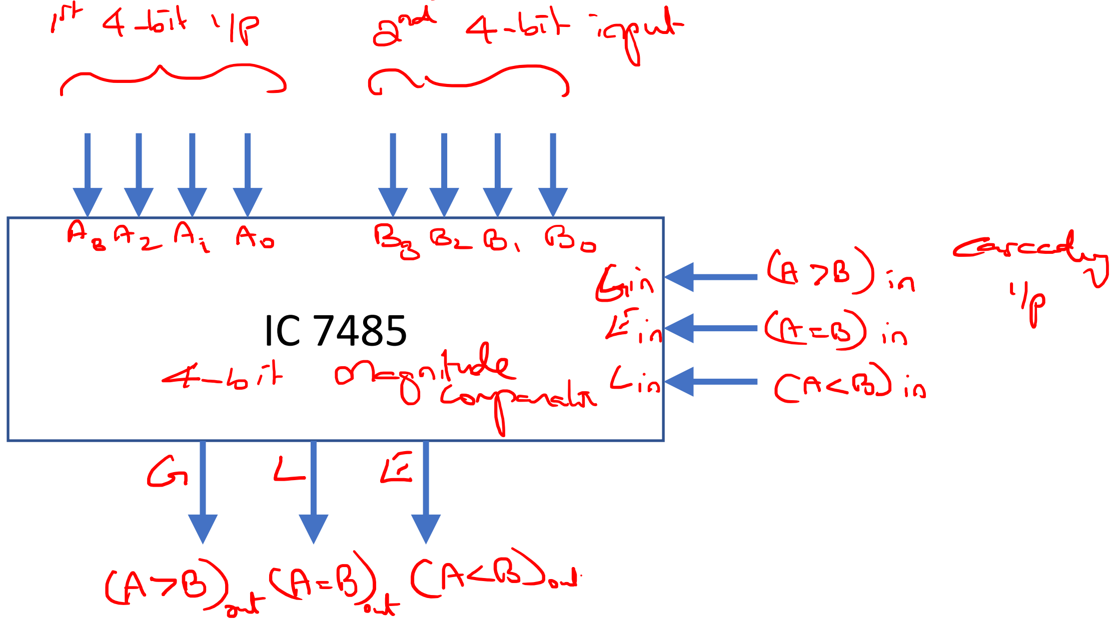


- 7485 IC (4-bit magnitude comparator with cascading inputs)

IC – Pin diagram



Schematic Diagram

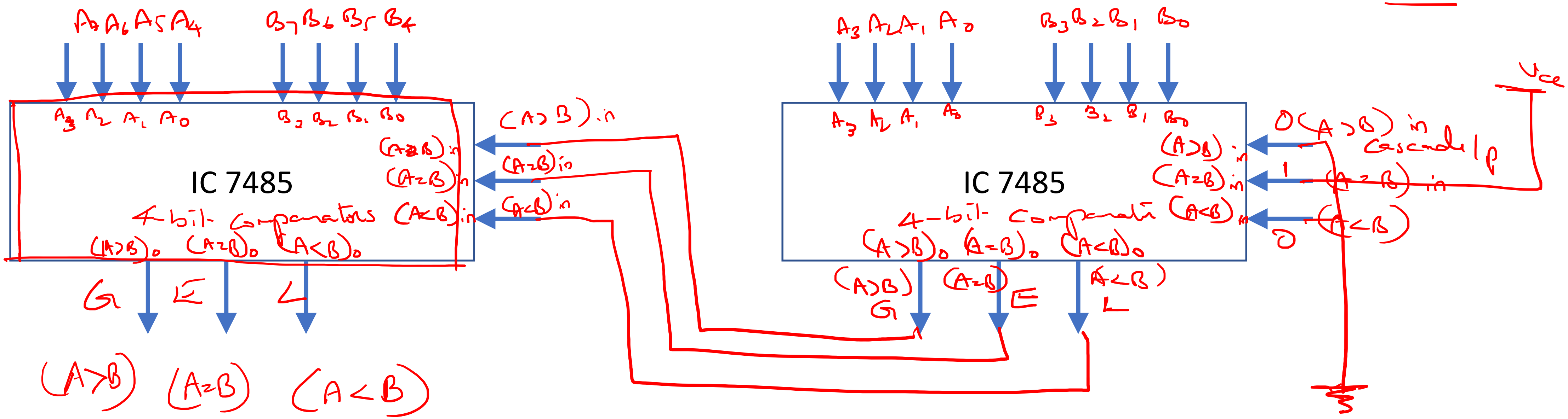


- Design 8-it magnitude comparator using 7485 ICs

$A = A_7 A_6 A_5 A_4 A_3 A_2 A_1 A_0$

$B = B_7 B_6 B_5 B_4 B_3 B_2 B_1 B_0$

To Check $A > B$
$A = B$
$A < B$



Don't forget

- Design a combinational circuit using 7483 IC and external gate to perform the arithmetic operations as shown below

4-bit Adder

ONLY one gate

$F = 2X + Y$ when m=0, & $F = X + 2Y$ when m=1

Where X, Y are two bit numbers and output F is a 4 bit number.

11 (max) ⇒ 3_{10}

$3 \times 3 = 9_{10}$

1001

X & Y are two bit Number

Control pin : m if m = 0 ; m = 1

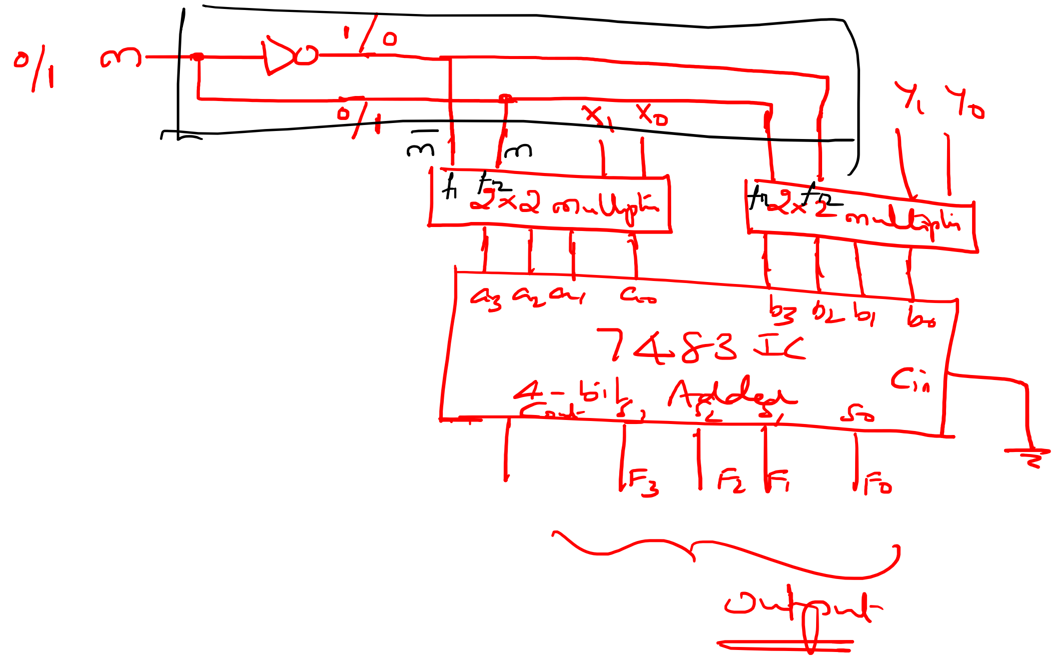
I/P I/P

$F = 2.X + 1.Y$

$F = 1.X + 2.Y$

$10 \times X + 01 \times Y$

$01 \times X + 10 \times Y$



10 (2-bit) 01 (2-bit)

m = 0 : $2 \times X + 1 \times Y$

m = 1 : $1 \times X + 2 \times Y$

01 10

m	f_1	f_2
0	1	0
1	0	1

$f_1 = \bar{m}$ $f_2 = m$

m	f_{11}	f_{12}
0	0	1
1	1	0

$f_{11} = m$

$f_{12} = \bar{m}$

- Questions?