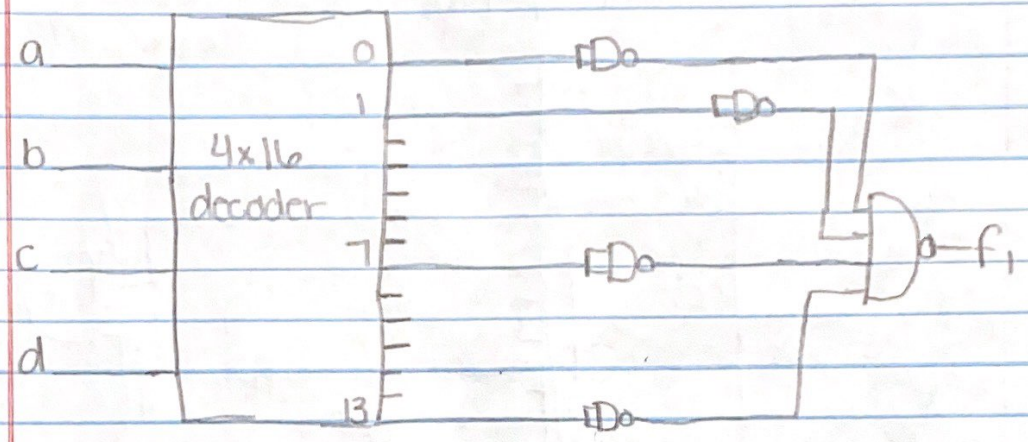
Hw 7

1. $f_1(a,b,c,d) = \Sigma m(0,1,7,13)$



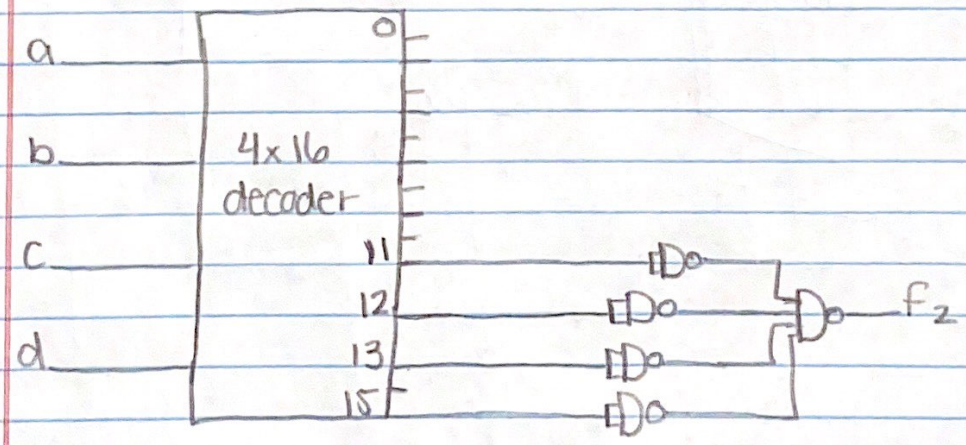
$f_2(a,b,c,d) = ab\bar{c} + acd$

SOP:

$f_2(a,b,c,d) = ab\bar{c}(d+\bar{d}) + a(b+\bar{b})cd$

$= ab\bar{c}d + ab\bar{c}\bar{d} + abcd + a\bar{b}cd$

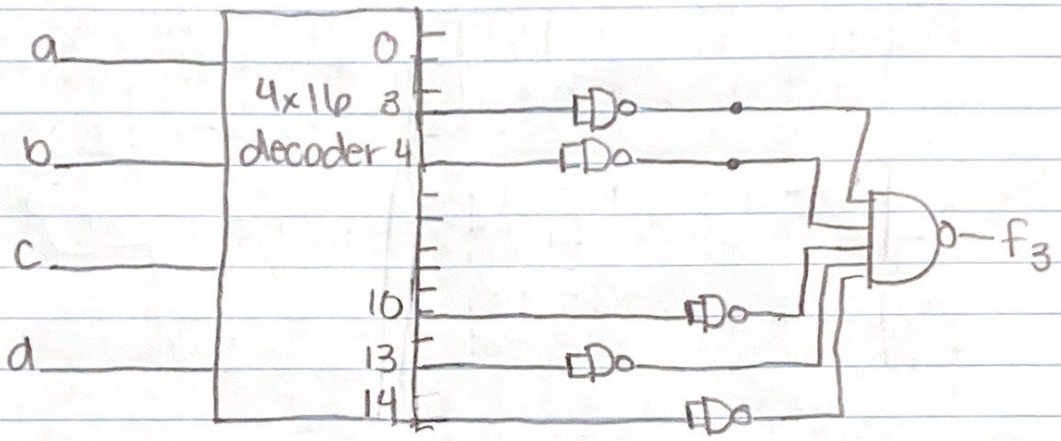
$f_2(a,b,c,d) = \Sigma m(11,12,13,15)$



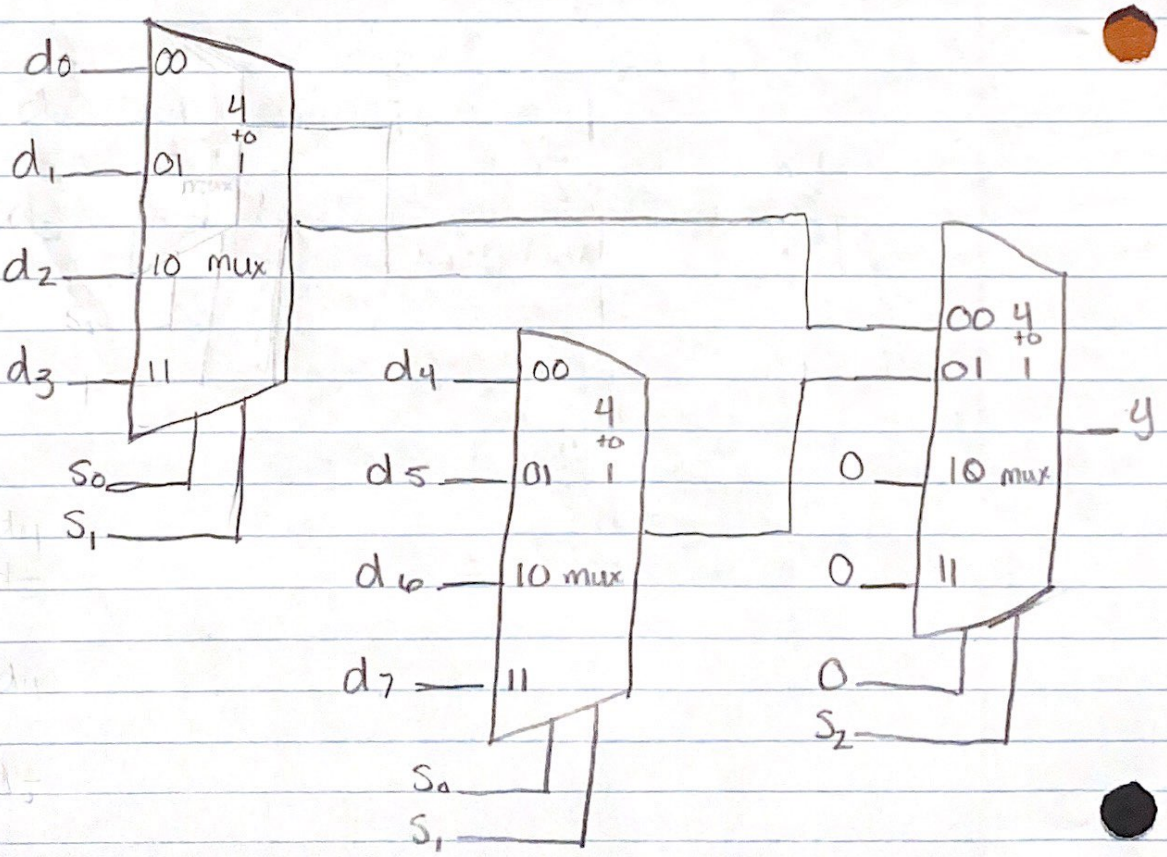
$f_3(a,b,c,d) = \Pi M(0,1,2,5,6,7,8,9,11,12,15)$

Minterms:

$f_3(a,b,c,d) = \Sigma m(3,4,10,13,14)$



2.

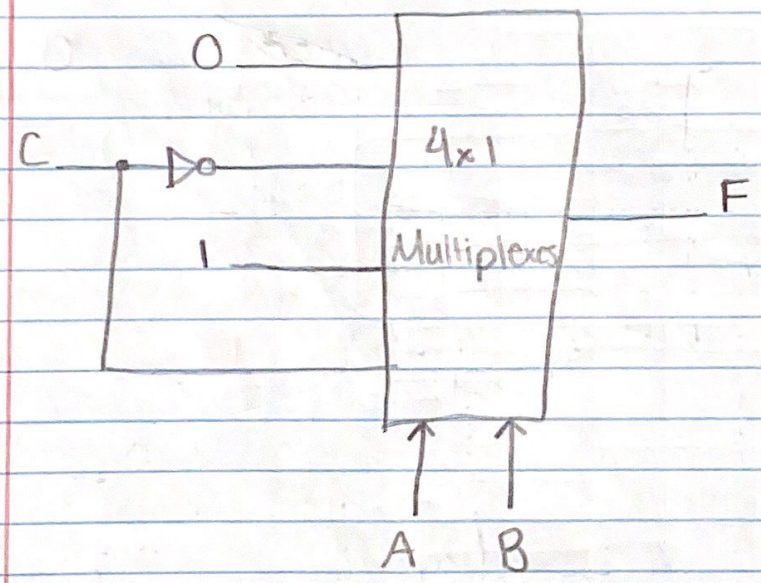


3. $f(a,b,c) = \Sigma m(2,4,5,7)$

	A	B	C	F
0	0	0	0	0
1	0	0	1	0
2	0	1	0	1
3	0	1	1	0
4	1	0	0	1
5	1	0	1	1
6	1	1	0	0
7	1	1	1	1

	I_0	I_1	I_2	I_3
C'	0	(2)	(4)	6
C	1	3	(5)	(7)
	0	C	1	C

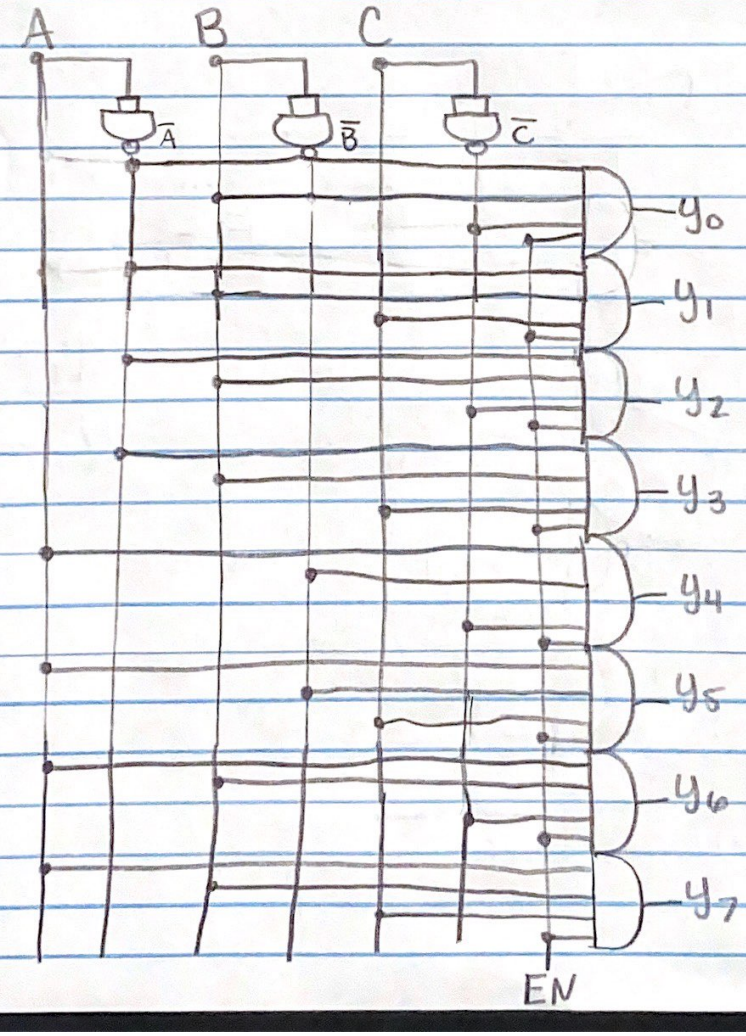
Circuit Diagram



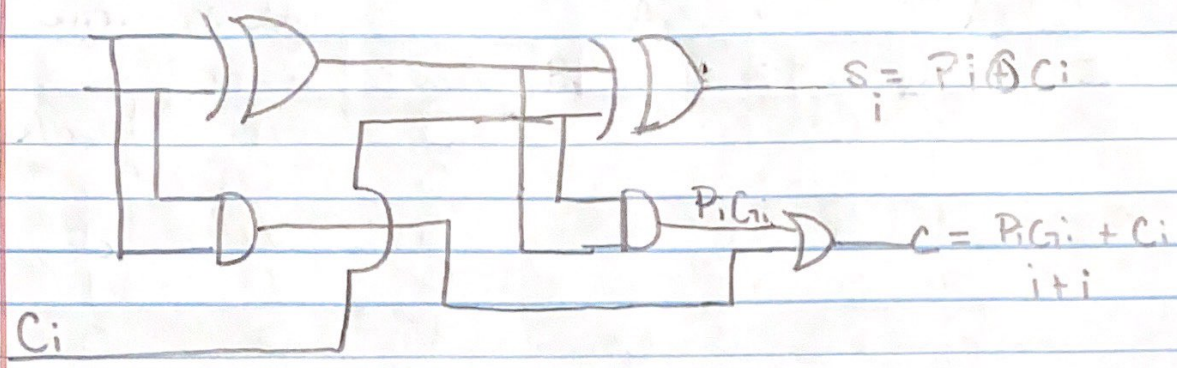
4.

Inputs			Outputs (active-low)							
A	B	C	y_0	y_1	y_2	y_3	y_4	y_5	y_6	y_7
0	0	0	0	1	1	1	1	1	1	1
0	0	1	1	0	1	1	1	1	1	1
0	1	0	1	1	0	1	1	1	1	1
0	1	1	1	1	1	0	1	1	1	1
1	0	0	1	1	1	1	0	1	1	1
1	0	1	1	1	1	1	1	0	1	1
1	1	0	1	1	1	1	1	1	0	1
1	1	1	1	1	1	1	1	1	1	0

Circuit Diagram



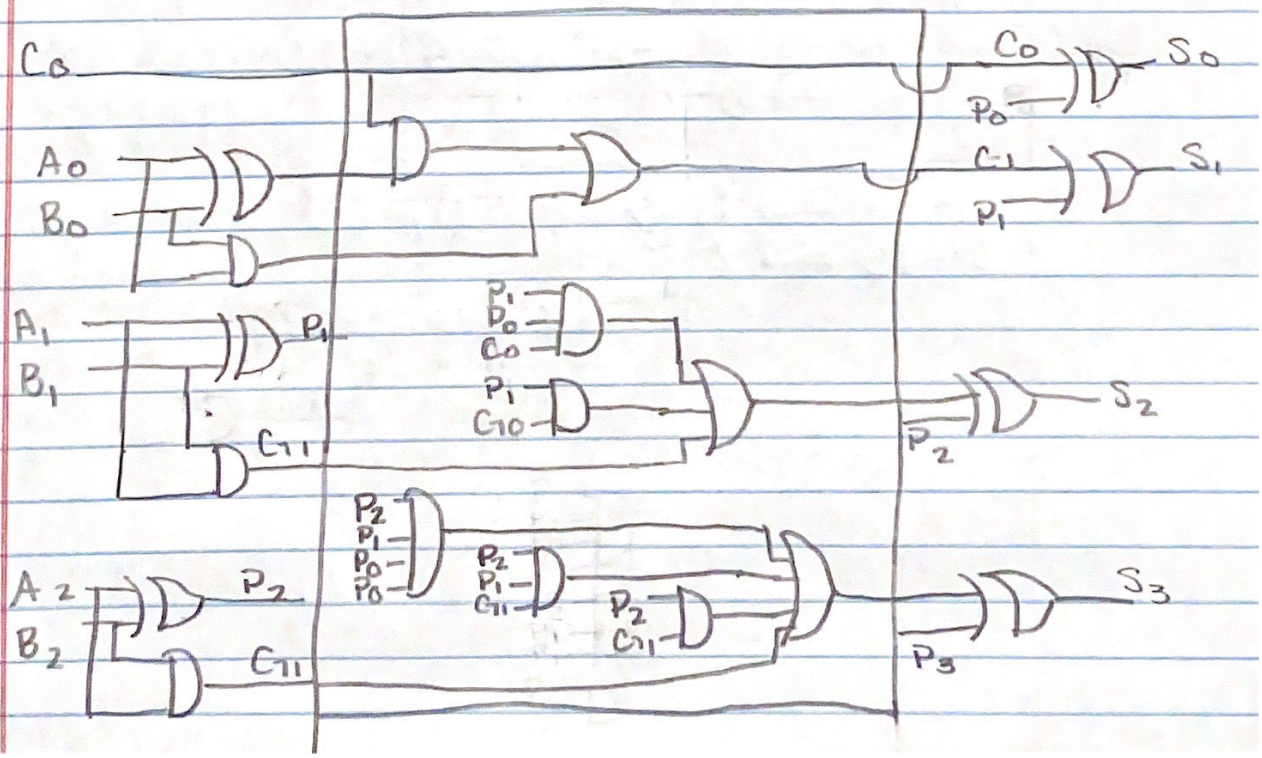
5.



$C_0 \Rightarrow$ i/p carry

$P_0 = A_0 \oplus B_0 \quad G_{10} = A_0 B_0 \quad S_0 = P_0 \oplus C_0$
$P_1 = A_1 \oplus B_1 \quad G_{11} = A_1 B_1 \quad S_1 = P_1 \oplus C_1$
$P_2 = A_2 \oplus B_2 \quad G_{12} = A_2 B_2 \quad S_2 = P_2 \oplus C_2$

$C_1 = P_0 C_0 + G_{10}$
$C_2 = P_1 C_1 + G_{11} = P_0 P_1 C_0 + P_1 G_{10} + G_{11}$
$C_3 = P_2 C_2 + G_{12} = P_2 P_1 P_0 C_0 + P_1 P_2 G_{11} + P_2 G_{11} + G_{12}$



6.

Inputs				Outputs		
A_1	A_0	B_1	B_0	A > B	A = B	A < B
0	0	0	0	0	1	0
0	0	0	1	0	0	1
0	0	1	0	0	0	1
0	0	1	1	0	0	1
0	1	0	0	1	0	0
0	1	0	1	0	1	0
0	1	1	0	0	0	1
0	1	1	1	0	0	1
1	0	0	0	1	0	0
1	0	0	1	1	0	0
1	0	1	0	0	1	0
1	0	1	1	0	0	1
1	1	0	0	1	0	0
1	1	0	1	1	0	0
1	1	1	0	1	0	0
1	1	1	1	0	1	0

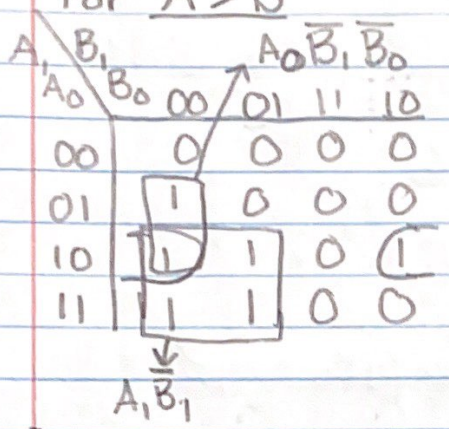
A = 01 $\equiv$ 1 $\Rightarrow$ A > B, so only A>B column only get o/p 1.
B = 00 $\equiv$ 0

A = 01 $\equiv$ 1 $\Rightarrow$ A < B, so only A<B column only get o/p 1.
B = 10 $\equiv$ 2

and so on.

K-maps

for $A > B$



$$A > B = A_0\overline{B_1}\,\overline{B_0} + A_1A_0\overline{B_0} + A_1\overline{B_1}$$

$A = B$

A_1A_0 \ B_1B_0	00	01	11	10
00	1	0	0	0
01	0	1	0	0
11	0	0	1	0
10	0	0	0	1

$$A=B = \overline{A_1}\,\overline{A_0}\,\overline{B_1}\,\overline{B_0} + \overline{A_1}A_0\overline{B_1}\,B_0 + A_1A_0B_1B_0 + A_1A_0\overline{B_1}\,\overline{B_0}$$

$$= \overline{A_1}\,\overline{B_1}(\overline{A_0}\,\overline{B_0} + A_0B_0) + A_1B_1(A_0B_0 + \overline{A_0}\,\overline{B_0})$$

$$= \overline{A_1}\,\overline{B_1}\,\overline{(A_0 \oplus B_0)} + A_1B_1(\overline{A_0 \oplus B_0})$$

$$= \overline{A_0 \oplus B_0}\,(\overline{A_1}\,\overline{B_1} + A_1B_1)$$

$$\text{For } A=B = \overline{A_0 \oplus B_0}\,\overline{(A_1 \oplus B_1)}$$

for A < B

A_1A_0 \ B_1B_0	00	01	11	10
00	0	1	1	1
01	0	0	1	1
11	0	0	0	0
10	0	0	1	0

$\bar{A}_1\bar{A}_0$ → $\bar{A}_1 B_1$

$\bar{A}_0 B_1 B_0$

for $A<B \Rightarrow \bar{A}_1 \bar{A}_0 B_0 + \bar{A}_0 B_1 B_0 + \bar{A}_1 B_1$

Circuit Diagram