CE212

Digital Systems

Homework#4

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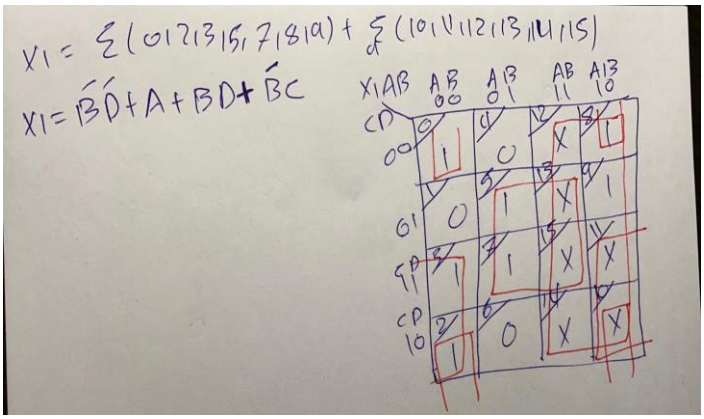
20201502049

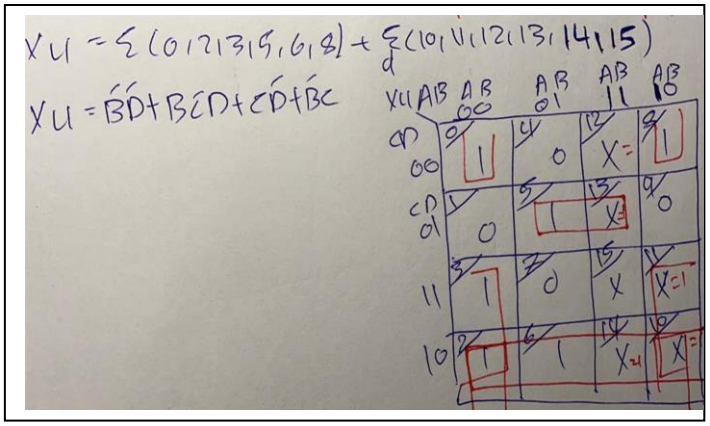
Question 1

a.

A	B	C	D	X1	X2	X3	X4	X5	X6	X7
0	0	0	0	1	1	1	1	1	1	0
0	0	0	1	0	1	1	0	0	0	0
0	0	1	0	1	1	0	1	1	0	1
0	0	1	1	1	1	1	1	0	0	1
0	1	0	0	0	1	1	0	0	1	1
0	1	0	1	1	0	1	1	0	1	1
0	1	1	0	0	0	1	1	1	1	1
0	1	1	1	1	1	1	0	0	0	0
1	0	0	0	1	1	1	1	1	1	1
1	0	0	1	1	1	1	0	0	1	1
1	0	1	0	X	X	X	X	X	X	X
1	0	1	1	X	X	X	X	X	X	X
1	1	0	0	X	X	X	X	X	X	X
1	1	0	1	X	X	X	X	X	X	X
1	1	1	0	X	X	X	X	X	X	X
1	1	1	1	X	X	X	X	X	X	X

b.





AB \ CD	00	01	11	10
00	1	1	1	1
01	1	0	1	0
11	X	X	X	X
10	1	1	X	X

X2 $= \overline{B} + \overline{C}\,\overline{D} + CD$

AB \ CD	00	01	11	10
00	1	0	0	1
01	0	0	0	1
11	X	X	X	X
10	1	0	X	X

X5 $= \overline{B}\,\overline{D} + C\overline{D}$

AB \ CD	00	01	11	10
00	1	1	1	0
01	1	1	1	1
11	X	X	X	X
10	1	1	X	X

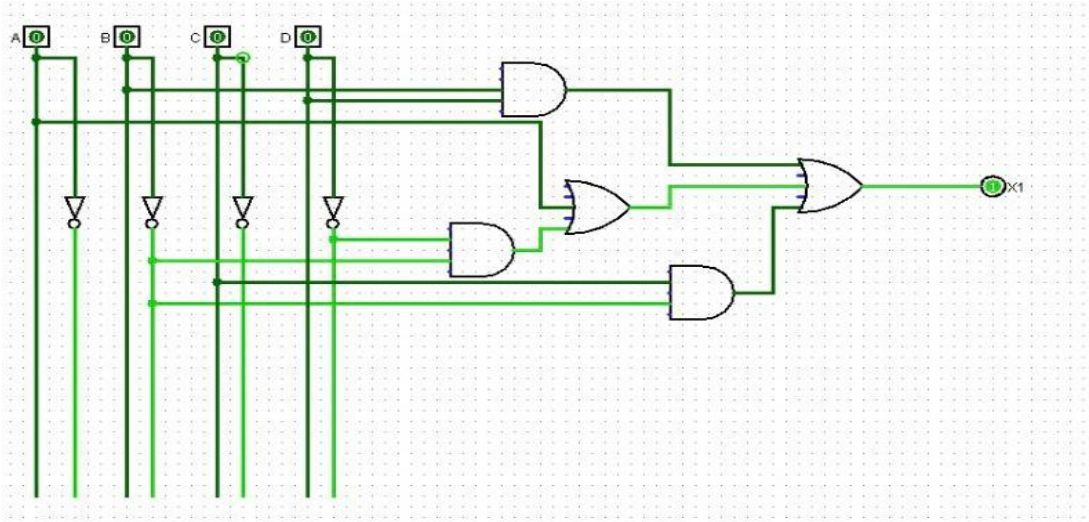
X3 $= B + \overline{C} + D$

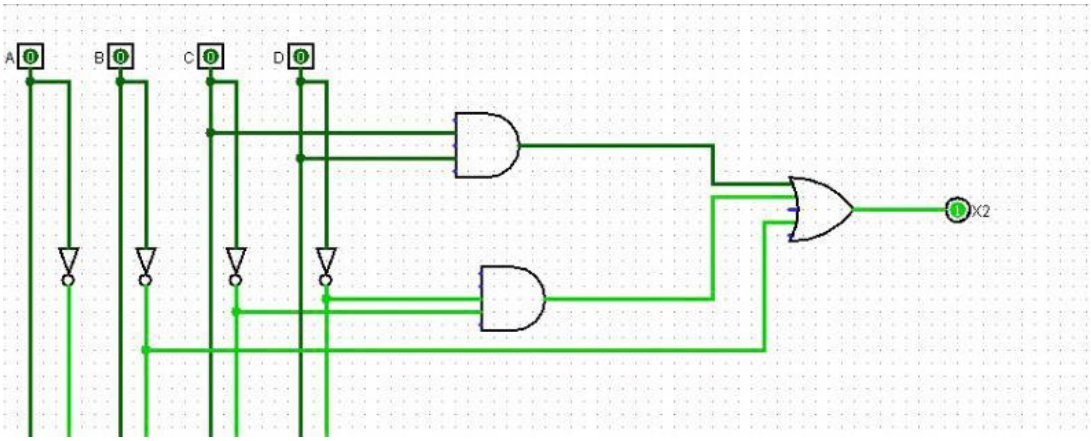
AB \ CD	00	01	11	10
00	1	0	0	0
01	1	1	0	1
11	X	X	X	X
10	1	1	X	X

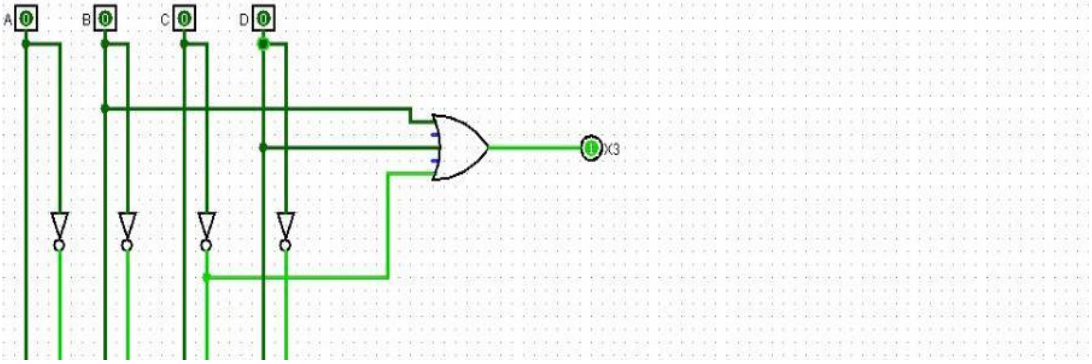
X6 $= A + B\overline{C} + B\overline{D} + \overline{C}\,\overline{D}$

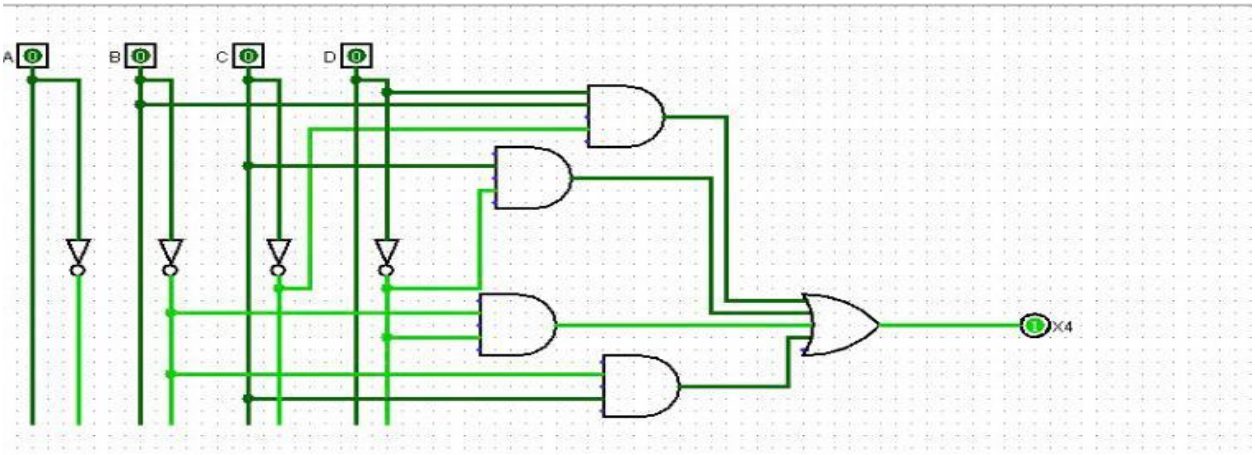
AB \ CD	00	01	11	10
00	0	0	1	1
01	1	1	0	1
11	X	X	X	X
10	1	1	X	X

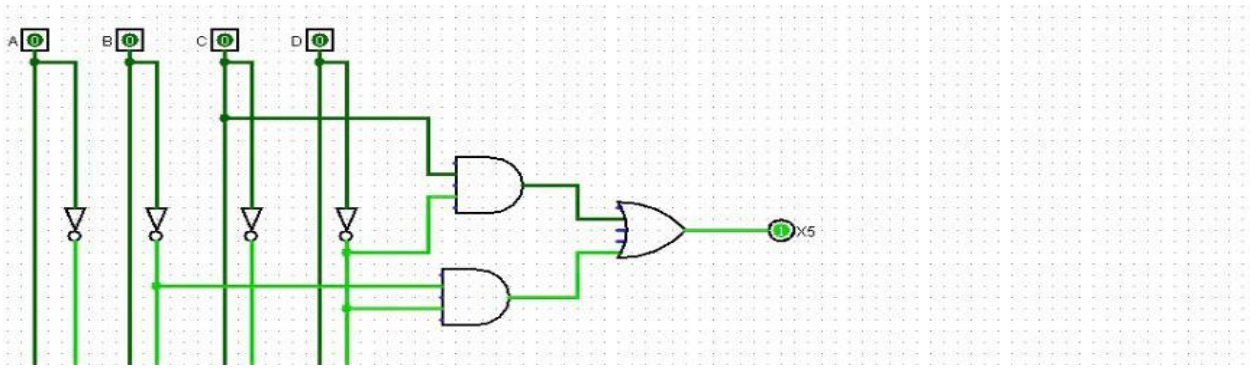
X7 $= A + B\overline{C} + \overline{B}C + C\overline{D}$

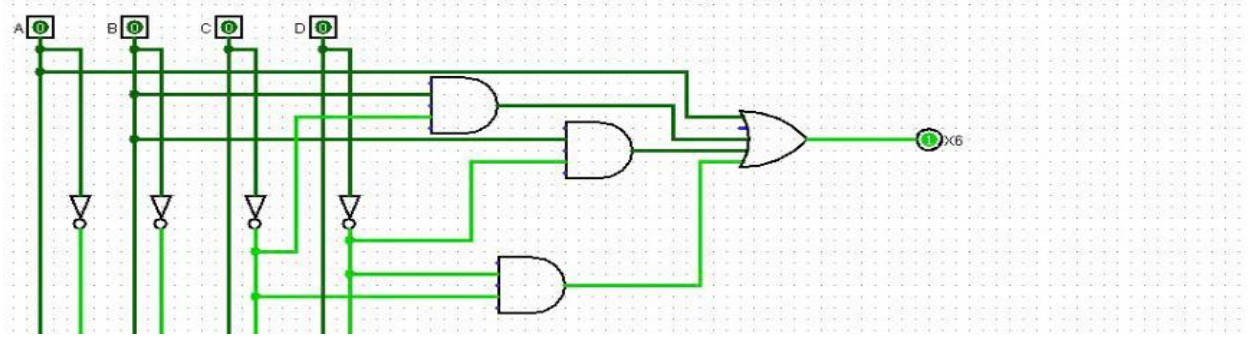

A
B
C
D
X1


A
B
C
D
X2


A
B
C
D
X3


A
B
C
D
X4


A
B
C
D
X5


A
B
C
D
X6

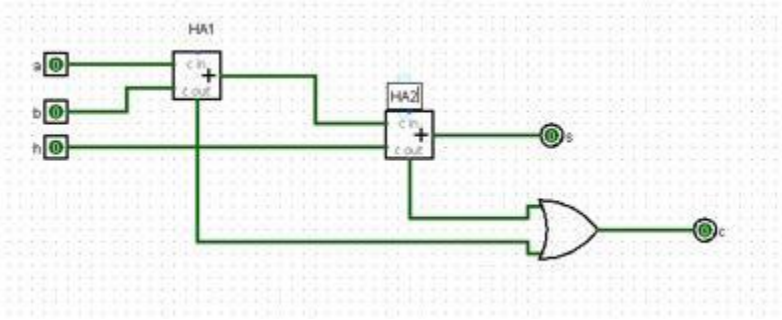
Part 2

Question 1

A	B	S	Cout
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

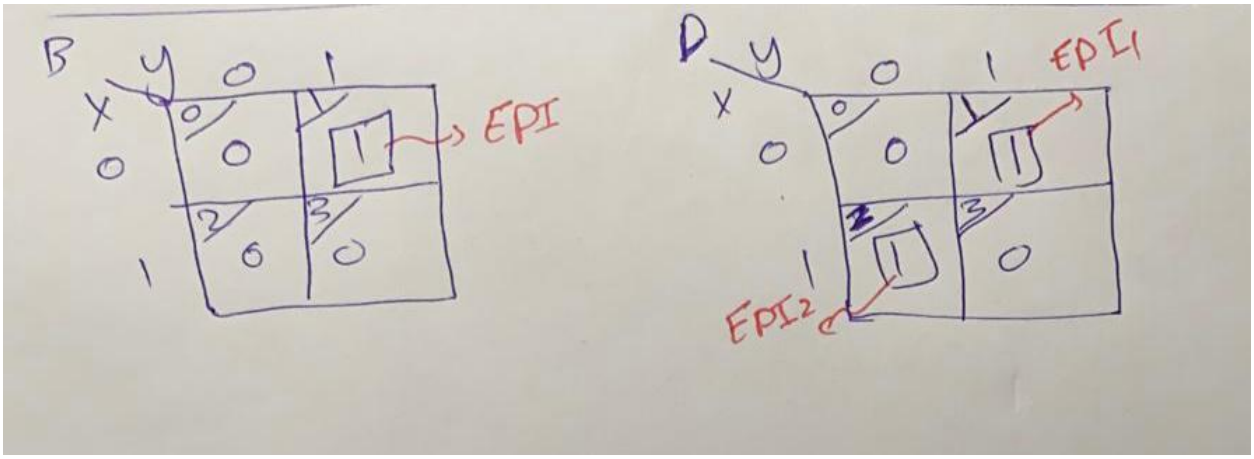
S(A,B)=A'B+AB' = A XOR B

Cout(A,B) = AB



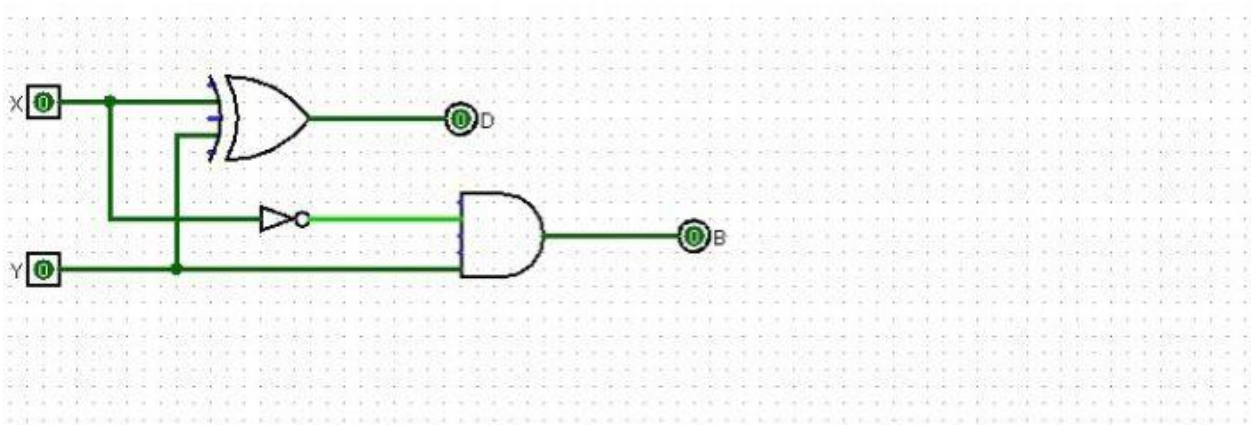
Question 2

X	Y	D	B
0	0	0	0
0	1	1	1
1	0	1	0
1	1	0	0



D(X,Y) = X XOR Y

B(X,Y) = X'.Y



Part 3

Question 1

F(A,B,C,D) = (A'.(A'D)')'.(A'+BC)

=(A'.(A+D'))'.(A'+BC)

=(A+(A'D)).(A'+BC)

=((A+A').(A+D)).(A'+BC)

=(A+D).(A'+BC) = (A.A')+(A.BC)+(A'.D)+(BC.D)

F(A,B,C,D) = ABC+A'D+BCD

F(A,B,C,D)= ABC(D+D')+A'D(B+B')+BCD(A+A')

=ABCD+ABCD'+A'DB+A'DB'+ABCD+A'BCD

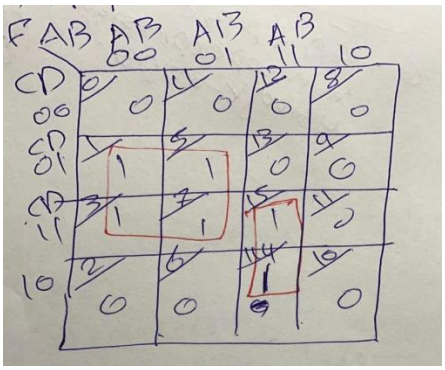
=ABCD+ABCD'+A'DB(C+C')+A'DB'(C+C')+ ABCD+A'BCD

=ABCD+ABCD'+A'BCD+A'BC'D+A'B'CD+A'B'C'D+ABCD+A'BCD

=m15+m14+m7+m5+m3+m1+m15+m7

F(A,B,C,D)= $\sum_m$(1,3,5,7,14,15)

F(A,B,C,D)= ABC+A'D



G(A,B,C,D) = (A'.D)'.(BC+A')

=(A+D').(A'+BC) = (A.A')+(A.BC)+(A'D')+(BCD')

= ABC+A'D'+BCD'= ABC(D+D')+A'D'(B+B')+BCD'(A+A')

=ABCD+ABCD'+A'BD'+A'B'D'+ABCD'+A'BCD'

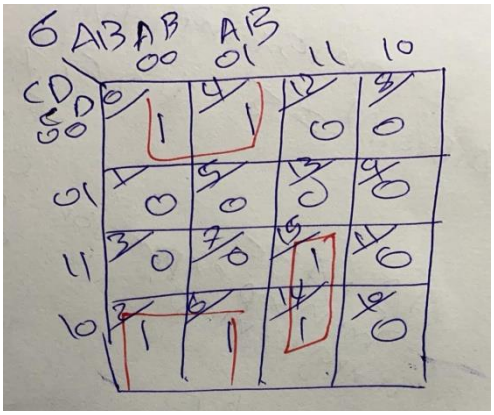
=ABCD+ABCD'+A'BD'(C+C')+A'B'D'(C+C')+ABCD'+A'BCD'

=ABCD+ABCD'+A'BCD'+A'BC'D'+A'B'CD'+A'B'C'D'+ABCD'+A'BCD'

=m15+m14+m6+m4+m2+m0+m14+m6

$G(A,B,C,D)= \sum_m(0,2,4,6,14,15)$

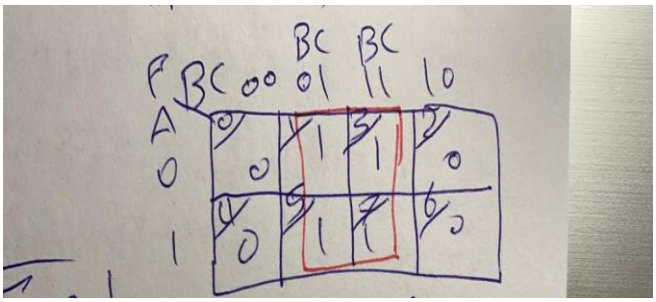
G(A,B,C,D)=ABC+A'D'



Question 2

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

F(A,B,C) = $\sum_m(1,3,5,7)$



F(A,B,C) = C

Question 3

(C'G'i + p'i)' = (Ci + Gi)Pi = GiPi + PiCi = AiBi(Ai + Bi) + PiCi = AiBi + PiCi = Gi + PiCi = AiBi + (Ai + Bi)Ci = AiBi + AiCi + BiCi = Ci+1

(PiG'i) ⊕ Ci = (Ai + Bi)(AiBi)' ⊕ Ci = (Ai + Bi)(A'i + B'i) ⊕ Ci = (A'iBi + AiB'i) ⊕ Ci = Ai ⊕ Bi ⊕ Ci = Si

Question 4

$F_1 = xy+xz'+yz'$

$F_2 = xz+xy+yz$

$F_3 = y'z+x'y'z'+xy$

$F_1 = xy(z+z')+xz'(y+y')+yz'(x+x')$

$=xyz+xyz'+xyz'+xy'z'+xyz'+x'yz'$

$=m7+m6+m4+m2 = \sum_m(2,4,6,7)$

$F_2= xz(y+y')+xy(z+z')+yz(x+x')$

$=xyz+xy'z+xyz+xyz'+xyz+x'yz = m7+m5+m6+m3 = \sum_m(3,5,6,7)$

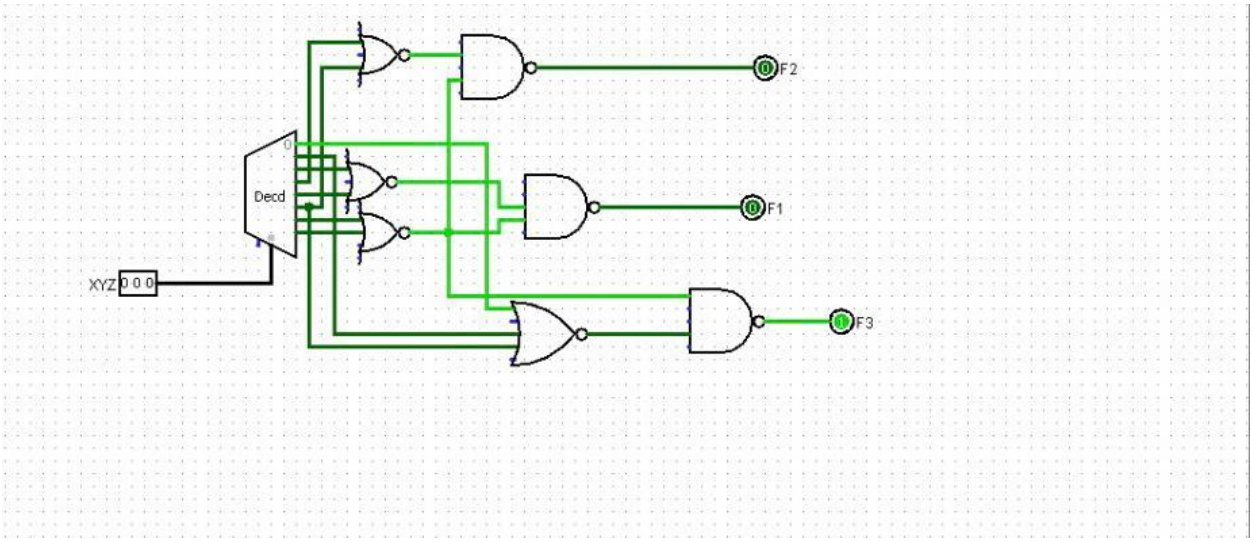
$F_3= y'z(x+x')+x'y'z'+xy(z+z') = xy'z+x'y'z+x'y'z'+xyz+xyz'$

$=m5+m1+m0+m7+m6= \sum_m(0,1,5,6,7)$

$F_1 = \sum_m(2,4,6,7)$

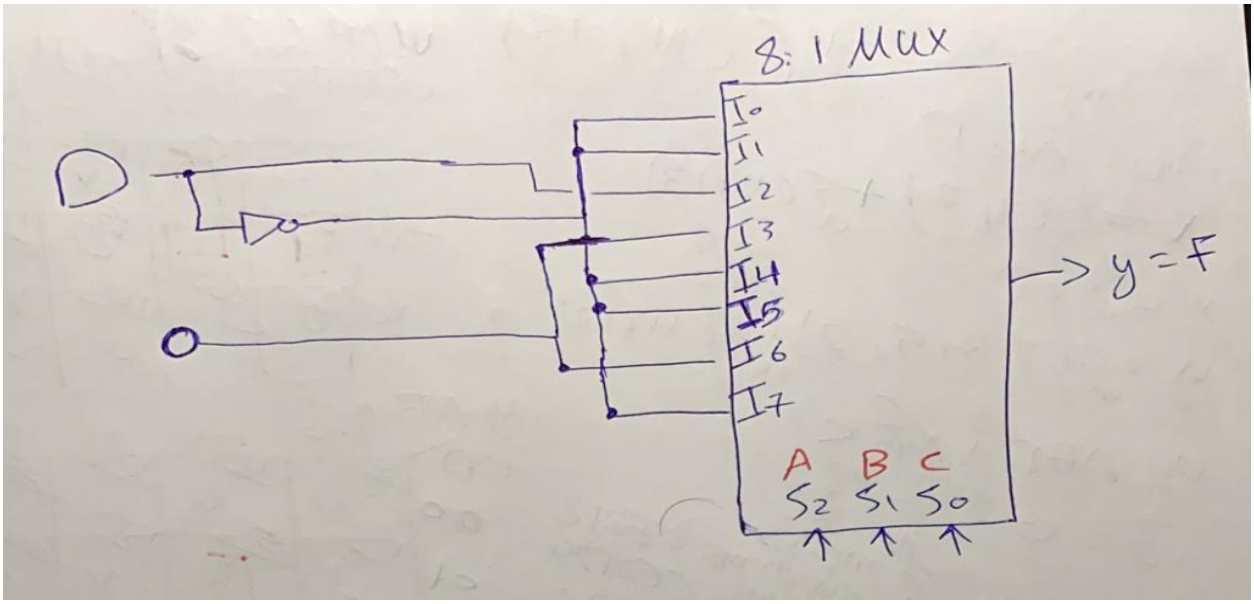
$F_2= \sum_m(3,5,6,7)$

$F_3 = \sum_m(0,1,5,6,7)$



Question 5

A	B	C	D	F	
0	0	0	0	1	F = D’
0	0	0	1	0	F = D’
0	0	1	0	1	F = D
0	0	1	1	0	F = 0
0	1	0	0	0	
0	1	0	1	1	F = D’
0	1	1	0	0	F = D’
0	1	1	1	0	
1	0	0	0	1	F = 0
1	0	0	1	0	F = D’
1	0	1	0	1	
1	0	1	1	0	
1	1	0	0	0	
1	1	0	1	0	
1	1	1	0	1	
1	1	1	1	0	



Question 6

X	Y	Z	D	B
0	0	0	0	0
0	0	1	1	1
0	1	0	1	1
0	1	1	0	1
1	0	0	1	0
1	0	1	0	0
1	1	0	0	0
1	1	1	1	1