4.1 Consider the circuit given in Figure P4.1 (Page 175)

a) Derive the Boolean expression for T1 through T4. Evaluate the outputs F1 and F2 as function of the four inputs

T1 = B' C

T2 = A'C

T3 = A + T1 = A + B'C

T4 = T2 ⊕ D = (A'C) ⊕D

F1 = T3 + T4 = A +B'C + ((A'C)⊕D)

F2 = T2 + D = A'C + D

4.4) Design a combinational circuit with three inputs and one output

a) The output is 1 when the binary value of the inputs is less than 3. The output is 0 otherwise.

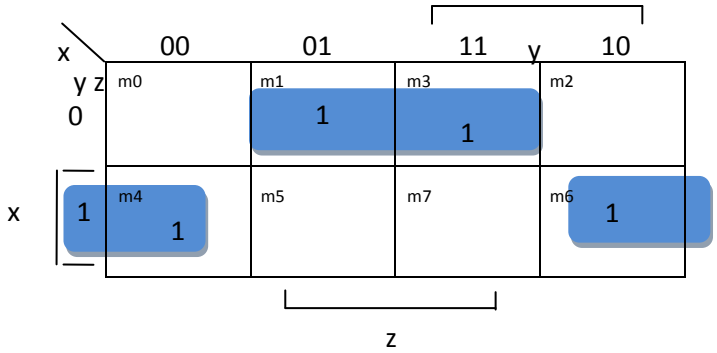
x	Y	z		F
0	0	0		1
0	0	1		1
0	1	0		1
0	1	1		0
1	0	0		0
1	0	1		0
1	1	0		0
1	1	1		0

b) the output is 1 when the binary value of the inputs is an odd number

x	Y	z		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

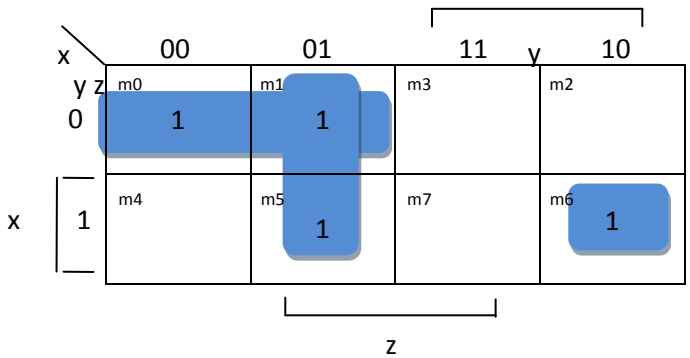
4.5) Design a combinational circuit with three inputs, x,y and z and three outputs A,B, and C. When Binary inputs is 0,1,2 or 3, the binary outputs is two greater than the input. When the binary input is 4,5,6 or 7, the binary output is three less than the input.

x	Y	z		A	B	C
0	0	0		0	1	0
0	0	1		0	1	1
0	1	0		1	0	0
0	1	1		1	0	1
1	0	0		0	0	1
1	0	1		0	1	0
1	1	0		0	1	1
1	1	1		1	0	0

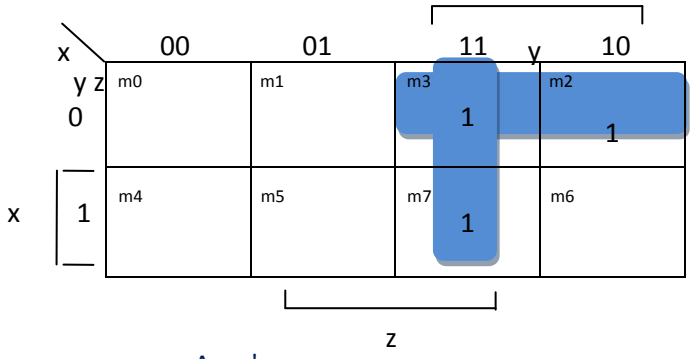


$C = x' z + x z'$

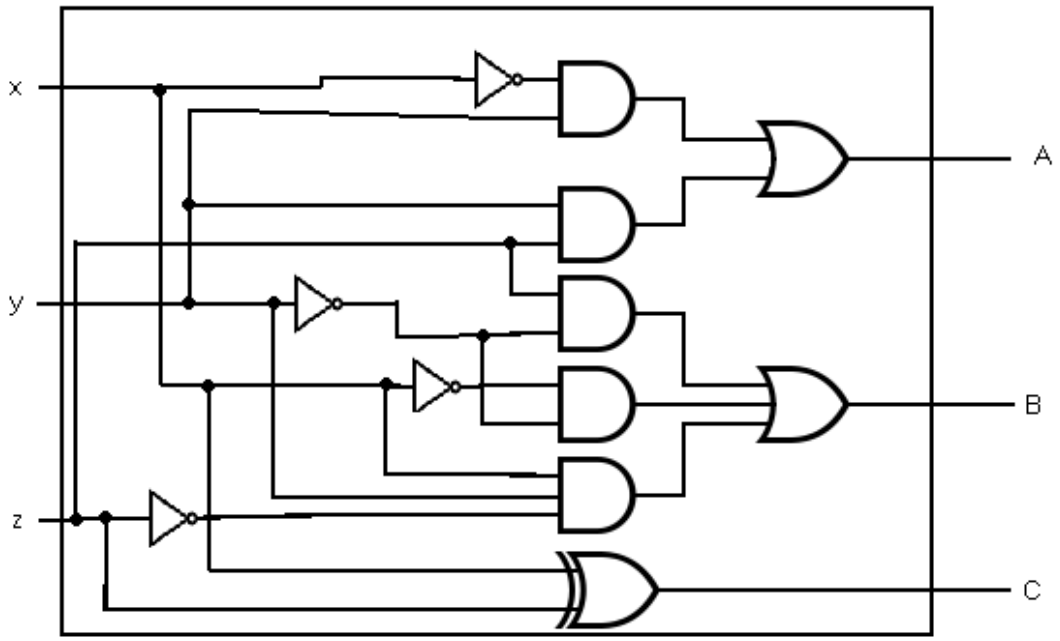
$C = x \oplus z$



$B = y' z + x' y' + x y z'$



$A = x' y + y z$

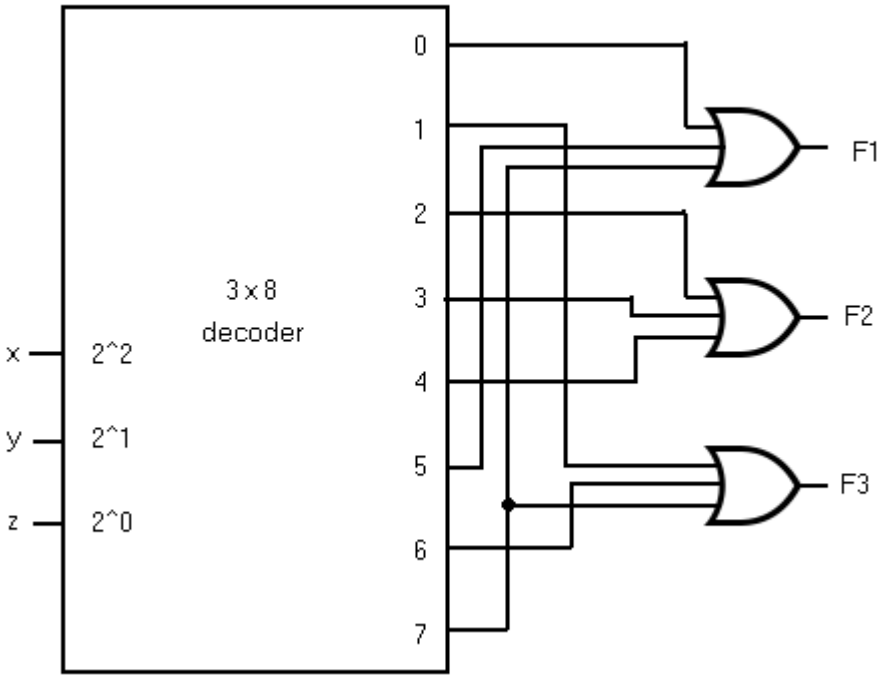

x
y
z
A
B
C

The Answer of Q.(4.28)(a)

F1= x' y' z' + x z = = x' y' z' + x y z + x y' z = ∑(0,5,7)

F2= x y' z' + x' y = x y' z' + x' y z' + x' y z = ∑(2,3,4)

F3= x' y' z +x y = x' y' z +x y z +x y z' = ∑(1,6,7)

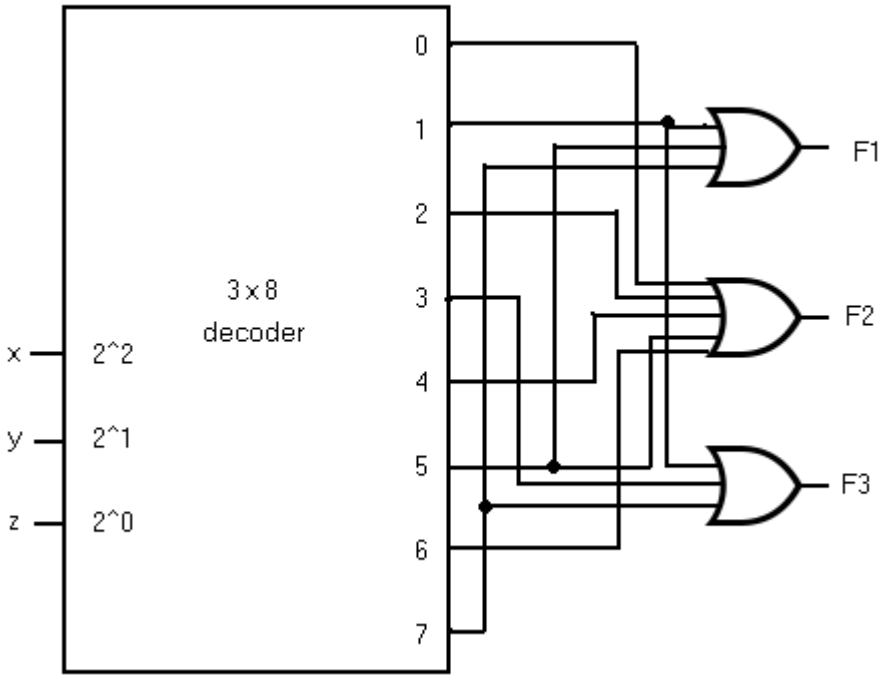


The Answer of Q.(4.28)(b)

F1= (y' + x) z = x y' z + x' y' z + x y z + ~~x y' z~~ = ∑(1,5,7)

F2= y' z' + x y' +y z' = x y' z' + x' y' z' + x y' z + ~~x y' z'~~ + x y z' + x' y z' = ∑(0,2,4,5,6)

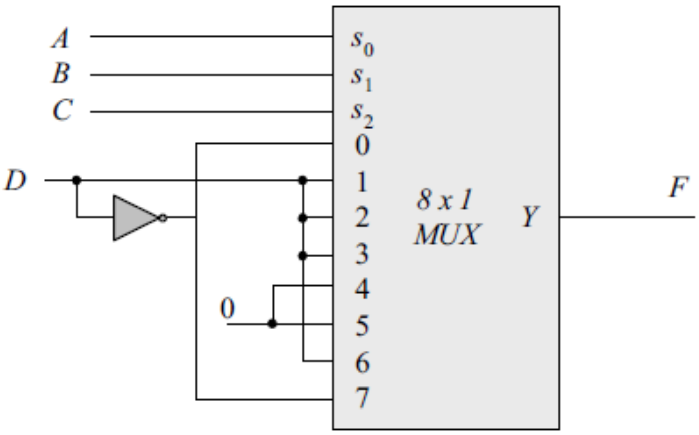
F3= (x' + y) z = x' y z + x' y' z + x y z + ~~x' y z~~ = ∑(1,3,7)



Q.(4.32) Implement the following Boolean function with a Multiplexer

(a) F (A, B, C, D) = ∑ (0, 2, 5, 7, 11 , 14)

Inputs ABCD	F	
0000	1	$F = D'$
0001	0	
0010	1	$F = D$
0011	0	
0100	0	$F = D$
0101	1	
0110	0	$F = D$
0111	1	
1000	0	$F = 0$
1001	0	
1010	0	$F = 0$
1011	0	
1100	0	$F = D$
1101	1	
1110	1	$F = D'$
1111	0	



b) F = (A, B, C, D) = π (3,8,12)

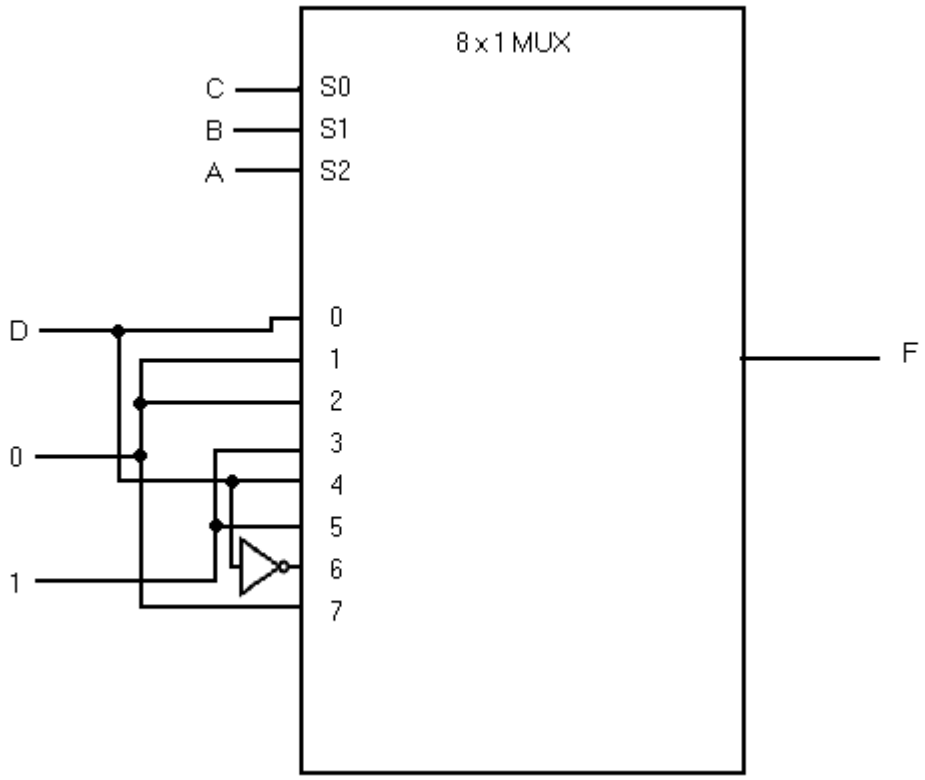
F' = ∑ (3 , 8 , 12)

F = ∑ (0, 1, 2, 4, 5, 6, 7, 9, 10, 11, 13, 14, 15)

Q.(4.34)

(a)

A	B	C	D	I
0	0	0	0	0
0	0	0	1	1
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	1
0	1	1	1	1
1	0	0	0	0
1	0	0	1	1
1	0	1	0	1
1	0	1	1	1
1	1	0	0	1
1	1	0	1	0
1	1	1	0	0
1	1	1	1	0



The Answer of Q.(4.34)(B)

A	B	C	D	I
0	0	0	0	1
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	1
0	1	1	1	1
1	0	0	0	0
1	0	0	1	1
1	0	1	0	0
1	0	1	1	1
1	1	0	0	1
1	1	0	1	0
1	1	1	0	1
1	1	1	1	1