باللطیف

رمنا ادیب پور

۹۸۱۴۳۰۳

تمرین سری ۳، سیستم دیجیتال

#1

a) $F(A,B,C) = \sum(3,5,6)$

A \ BC	00	01	11	10
0			1	
1		1		1

$F(A,B,C) = \bar{A}BC + A\bar{B}C + AB\bar{C}$

b) $F(A,B,C) = \prod(1,2,3,6,7)$

A \ BC	00	01	11	10
0		0	0	0
1			0	0

$\bar{F}(A,B,C) = B + \bar{A}C$

$F(A,B,C) = \bar{B}\,(A+\bar{C})$

c) $F(w,x,y,z) = \sum(2,3,8,12,14,15)$

wx \ yz	00	01	11	10
00			1	1
01				
11	1		1	1
10	1			

$F(w,x,y,z) = \bar{w}\bar{x}y + w\bar{y}\bar{z} + wxy$

d) $F(w,x,y,z) = \sum(0,2,4,5,6,7,8,10,13)$

wx \ yz	00	01	11	10
00	1			1
01	1	1	1	1
11		1		
10	1			1

$F(w,x,y,z) = \bar{w}x + \bar{x}\bar{z} + x\bar{y}z$

e) $wxy + yz + \bar{y}wz + \bar{x}y = wxy(z+\bar{z}) + yz(x+\bar{x})(w+\bar{w}) + \bar{y}wz(x+\bar{x}) + \bar{x}y(z+\bar{z})\cdot(w+\bar{w})$

$= wxyz + wxy\bar{z} + wxyz + w\bar{x}yz + \bar{w}xyz + \bar{w}\bar{x}yz + wx\bar{y}z + w\bar{x}\bar{y}z$

$+ w\bar{x}yz + w\bar{x}y\bar{z} + \bar{w}\bar{x}yz + \bar{w}\bar{x}y\bar{z}$

$\Rightarrow F(w,x,y,z) = yz + wy + wz + \bar{x}y$

wx \ yz	00	01	11	10
00			1	1
01			1	
11		1	1	1
10		1	1	1

f) $\bar{B}D + \bar{A}B\bar{C} + A\bar{B}C + AB\bar{C} = \bar{B}D(A+\bar{A})(C+\bar{C}) + \bar{A}B\bar{C}(D+\bar{D}) + A\bar{B}C(D+\bar{D}) + AB\bar{C}(D+\bar{D})$

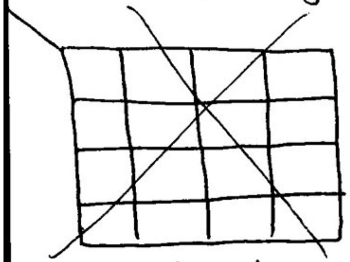
$= A\bar{B}CD + A\bar{B}\bar{C}D + \bar{A}\bar{B}CD + \bar{A}\bar{B}\bar{C}D + \bar{A}B\bar{C}D + \bar{A}B\bar{C}\bar{D} + A\bar{B}CD + A\bar{B}C\bar{D} + AB\bar{C}D + AB\bar{C}\bar{D}$

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

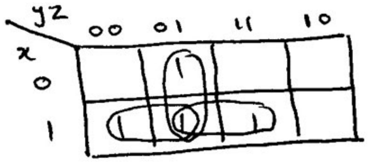
$F(A,B,C,D) = B\bar{C} + \bar{A}\bar{B}D + A\bar{B}C$

#2

a) $xyz + \bar{y}z + x\bar{y} = xyz + \bar{y}z(x+\bar{x}) + x\bar{y}(z+\bar{z}) = xyz + x\bar{y}z + \bar{x}\bar{y}z + x\bar{y}z + x\bar{y}\bar{z}$



خطا انساني

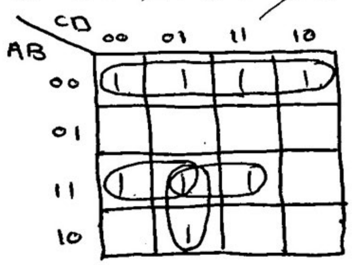


$F(x,y,z) = x\bar{y} + xz + \bar{y}z$

$= \sum(1,4,5,7)$

b) $A\bar{C}D + AB\bar{C} + ABD + \bar{A}\bar{B} = A\bar{C}D(B+\bar{B}) + AB\bar{C}(D+\bar{D}) + ABD(C+\bar{C}) + \bar{A}\bar{B}(C+\bar{C})(D+\bar{D})$

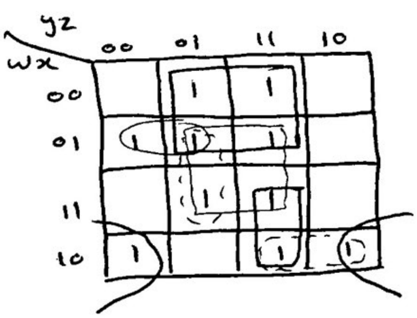
$= AB\bar{C}D + A\bar{B}\bar{C}D + AB\bar{C}D + AB\bar{C}\bar{D} + ABCD + AB\bar{C}D + \bar{A}\bar{B}CD + \bar{A}\bar{B}C\bar{D} + \bar{A}\bar{B}\bar{C}D + \bar{A}\bar{B}\bar{C}\bar{D}$



$F(A,B,C,D) = \sum(0,1,2,3,9,12,13,15)$

#3

$F(w,x,y,z) = \sum(1,3,4,5,7,8,10,11,13,15)$



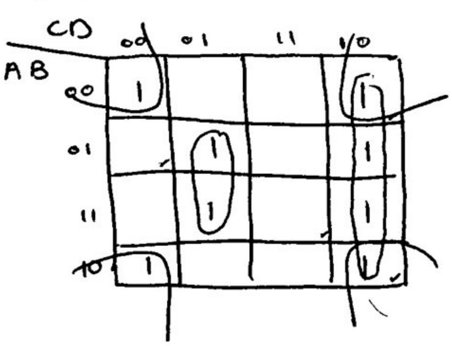
non-essential : wyz, $w\bar{x}y$, xz

essential : $\bar{w}z$, $\bar{w}x\bar{y}$, $w\bar{x}\bar{z}$

$\Rightarrow F(w,x,y,z) = \bar{w}z + \bar{w}x\bar{y} + w\bar{x}\bar{z} + (wyz \text{ OR } w\bar{x}y \text{ OR } xz)$

#4

a) $G(A,B,C,D) = \sum m(0,5,6,8,13,14) + \sum d(2,4,10,15)$



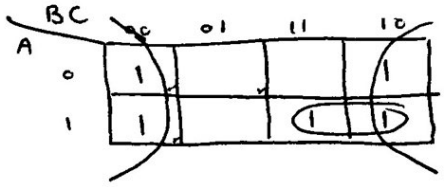
$G(A,B,C,D) = C\bar{D} + \bar{B}\bar{D} + \bar{C}DB = \sum(0,5,6,8,13,14,10,2)$

4

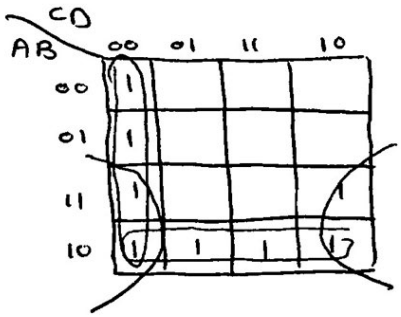
ادامه سؤال 3 :

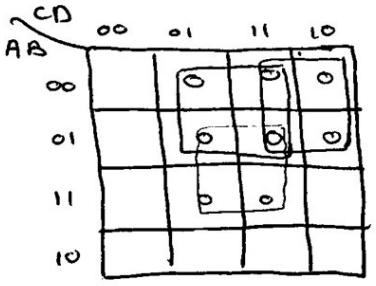
b) $F(A,B,C) = \sum m(2,6,7) + \sum d(0,1,4)$

$F(A,B,C) = \sum(0,2,4,6,7) = \bar{C} + AB$



#5 $F(A,B,C,D) = \sum(0,4,8,9,10,11,12,14)$

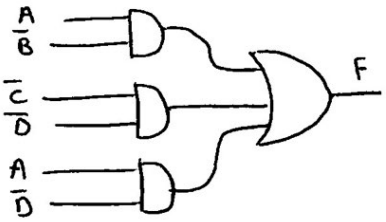


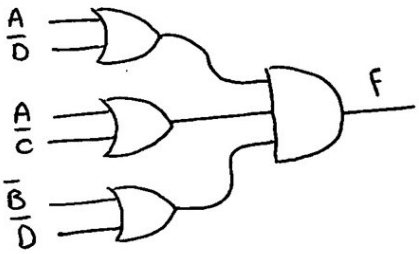


$F(A,B,C,D) = A\bar{B} + \bar{C}\bar{D} + A\bar{D}$

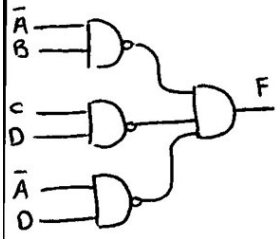
$\bar{F} = \bar{A}D + \bar{A}C + BD$

$F = (A+\bar{D})(A+\bar{C})(\bar{B}+\bar{D})$

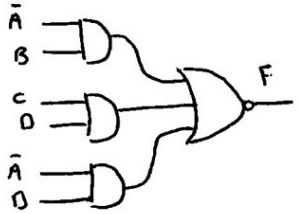




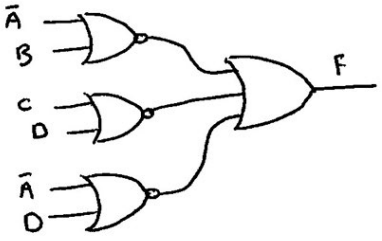
a) NAND-AND



b) AND-NOR



c) NOR-OR



d) OR-NAND