

ITI1100A
Assignment # 4
SOLUTIONS

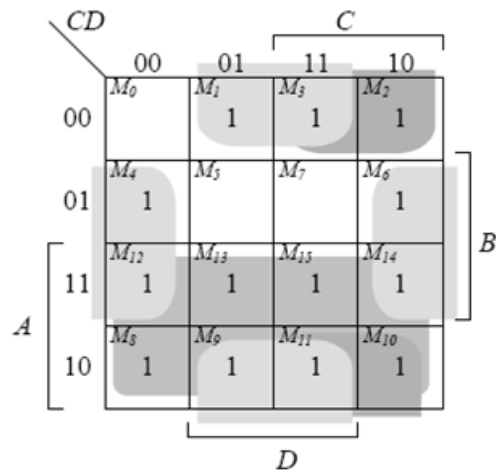
4.1

(a) $T_1 = B'C, T_2 = A'B, T_3 = A + T_1 = A + B'C,$
 $T_4 = D \oplus T_2 = D \oplus (A'B) = A'BD' + D(A + B') = A'BD' + AD + B'D$
 $F_1 = T_3 + T_4 = A + B'C + A'BD' + AD + B'D$
 With $A + AD = A$ and $A + A'BD' = A + BD'$:
 $F_1 = A + B'C + BD' + B'D$
 Alternative cover: $F_1 = A + CD' + BD' + B'D$

$F_2 = T_2 + D' = A'B + D'$

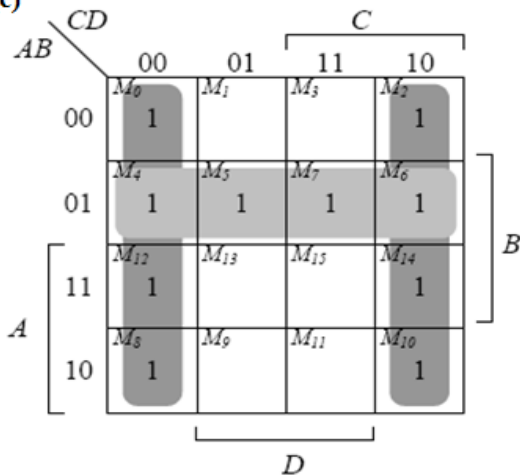
(b)

ABCD	T ₁	T ₂	T ₃	T ₄	F ₁	F ₂
0000	0	0	0	0	0	1
0001	0	0	0	1	1	0
0010	1	0	1	0	1	1
0011	1	0	1	1	1	0
0100	0	1	0	1	1	1
0101	0	1	0	0	0	1
0110	0	1	0	1	1	1
0111	0	1	0	0	0	1
1000	0	0	1	0	1	1
1001	0	0	1	1	1	0
1010	1	0	1	0	1	1
1011	1	0	1	1	1	0
1100	0	0	1	0	1	1
1101	0	0	1	1	1	0
1110	0	0	1	0	1	1
1111	0	0	1	1	1	0

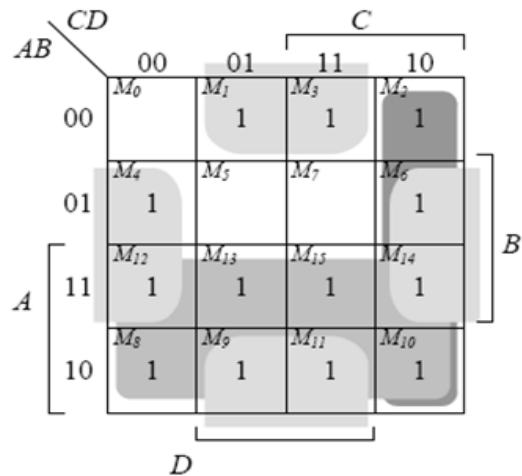


$F_1 = A + B'C + B'D + BD'$

(c)



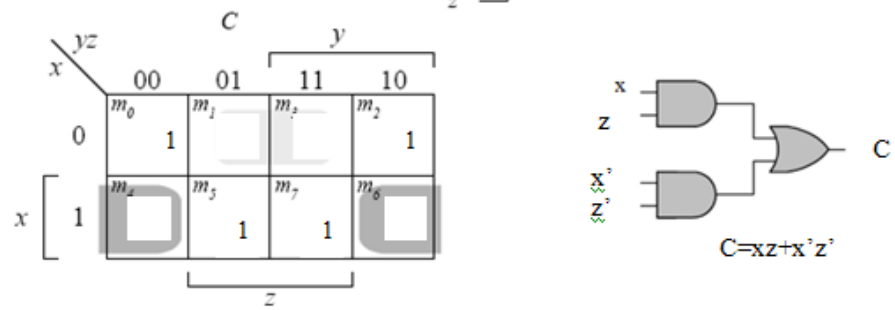
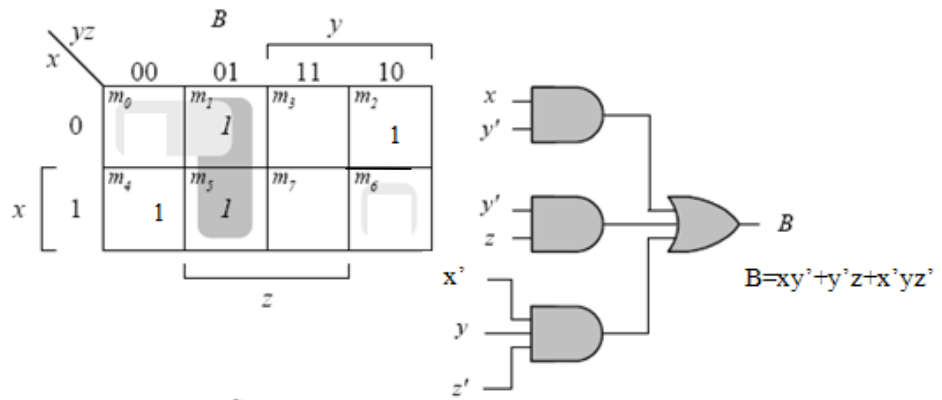
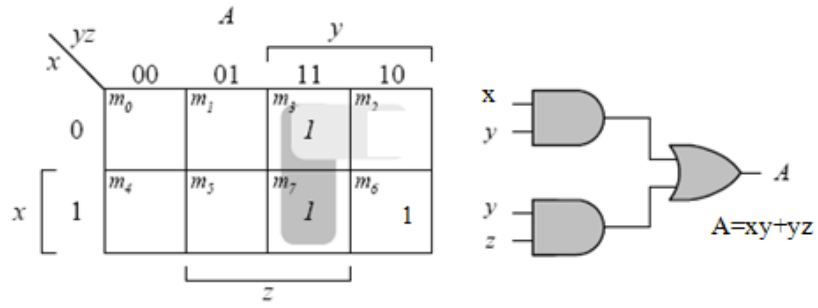
$F_2 = A'B + D'$



$F_1 = A + CD' + B'D + BD'$

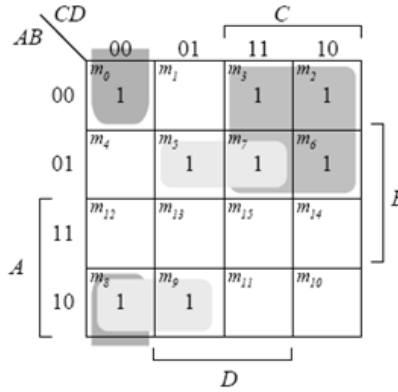
4.5

xyz	ABC
000	001
001	010
010	011
011	100
100	010
101	011
110	100
111	101



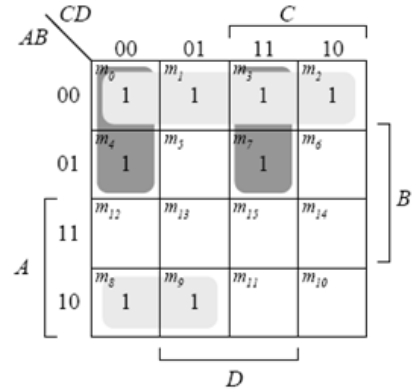
4.9

ABCD	a	b	c	d	e	f	g
0000	1	1	1	1	1	1	0
0001	0	1	1	0	0	0	0
0010	1	1	0	1	1	0	1
0011	1	1	1	1	0	0	1
0100	0	1	1	0	0	1	1
0101	1	0	1	1	0	1	1
0110	1	0	1	1	1	1	1
0111	1	1	1	0	0	0	0
1000	1	1	1	1	1	1	1
1001	1	1	1	1	0	1	1

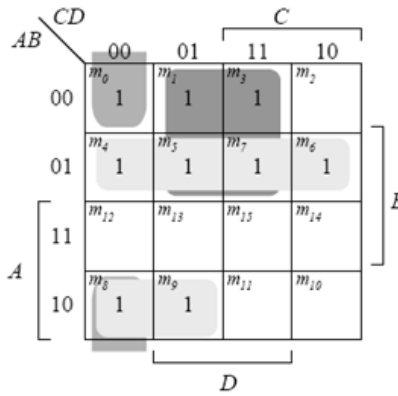


$$a = A'C + A'BD + AB'C' + A'B'D'$$

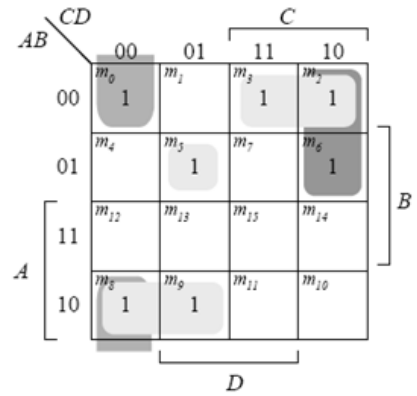
$$a = A'C + A'BD + B'C'D' + AB'C'$$



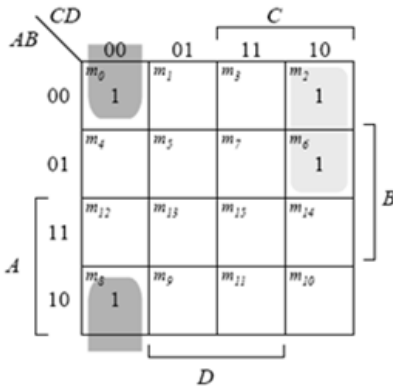
$$b = A'B' + B'C' + A'CD' + A'CD$$



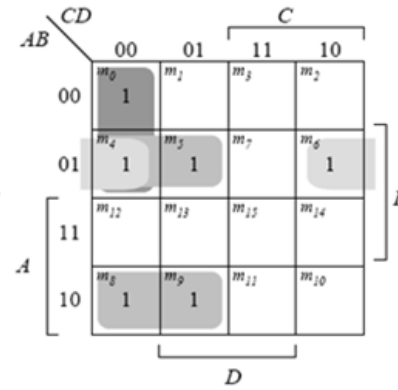
$$c = A'B + A'D + B'C'$$



$$d = A'CD' + A'B'C + B'C'D' + AB'C' + A'BC'D$$

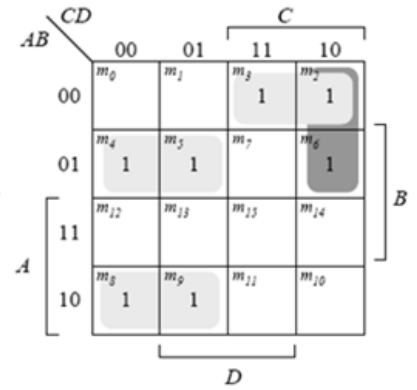


$$e = A'CD' + B'C'D'$$



$$f = A'BC' + A'C'D' + A'BD + AB'C'$$

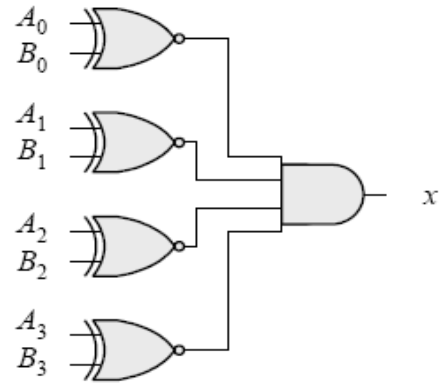
$$\text{or } f = A'BC' + AB'C' + A'BD + B'C'D'$$



$$g = A'CD' + A'B'C + A'BC' + AB'C'$$

$$\text{or } g = A'BC' + AB'C' + A'B'C + A'BD$$

4.21

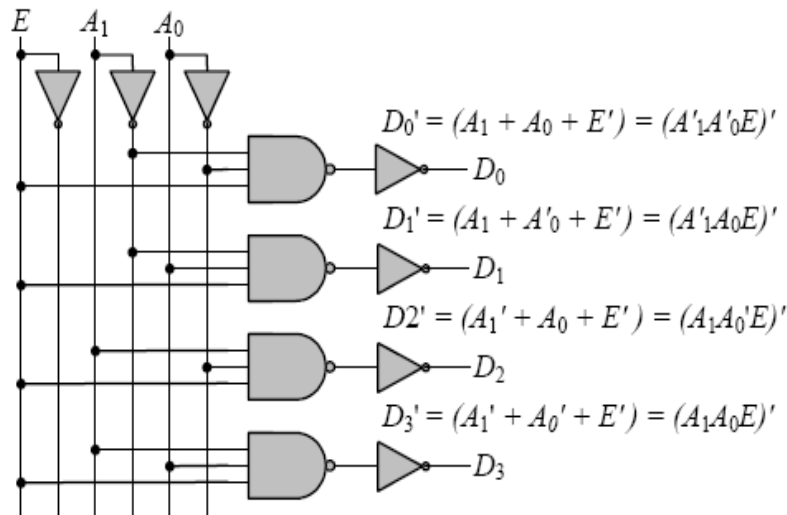
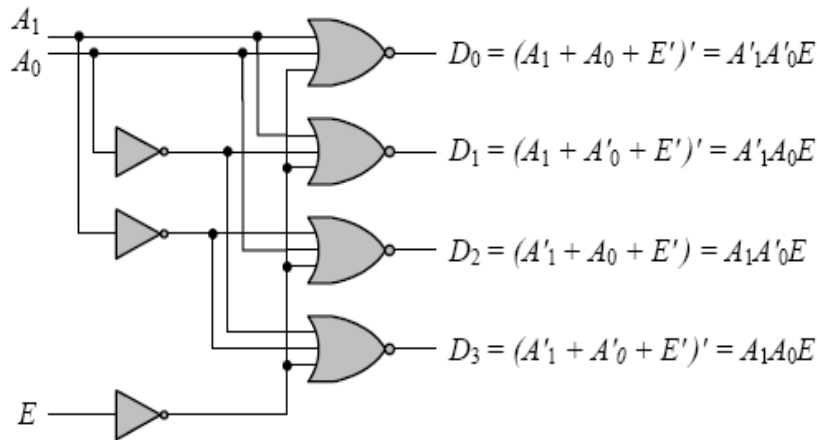


$$x = (A_0 \oplus B_0)'(A_1 \oplus B_1)'(A_2 \oplus B_2)'(A_3 \oplus B_3)'$$

4.23

$$\begin{aligned} D_0 &= A_1'A_0'E = (A_1 + A_0 + E)' \text{ [NOR]} \\ D_1 &= A_1'A_0E = (A_1 + A_0' + E)' \text{ [NOR]} \\ D_2 &= A_1A_0'E = (A_1' + A_0 + E)' \text{ [NOR]} \\ D_3 &= A_1A_0E = (A_1' + A_0' + E)' \text{ [NOR]} \end{aligned}$$

$$\begin{aligned} D_0' &= (A_1'A_0'E)' \text{ [NAND]} \\ D_1' &= (A_1'A_0E)' \text{ [NAND]} \\ D_2' &= (A_1A_0'E)' \text{ [NAND]} \\ D_3' &= (A_1A_0E)' \text{ [NAND]} \end{aligned}$$

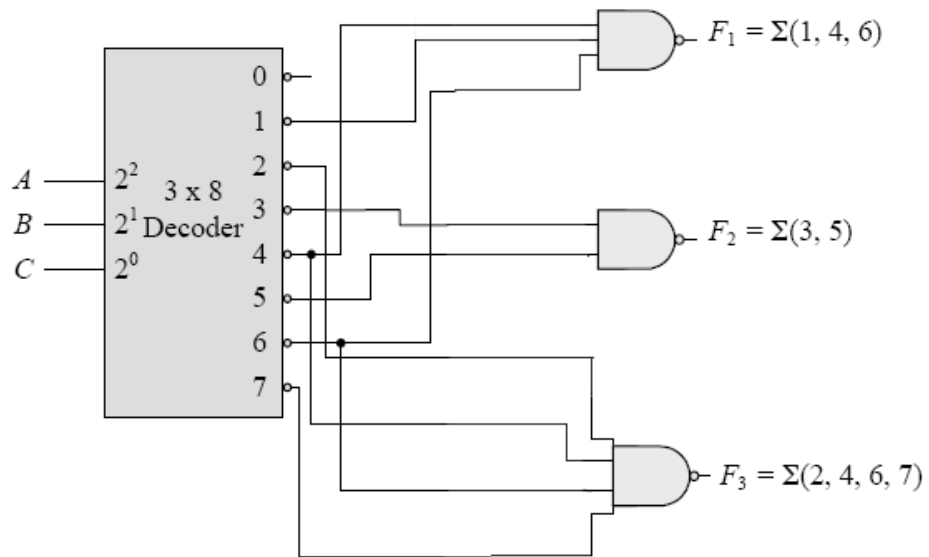


4.27

$$F_1(A,B,C) = \sum(1,4,6) = A'B'C + AB'C' + ABC' = (A'B'C)'(AB'C)'(ABC)'$$

$$F_2(A,B,C) = \sum(3,5) = A'BC + AB'C = (A'BC)'(AB'C)'$$

$$F_3(A,B,C) = \sum(2,4,6,7) = A'BC' + AB'C' + ABC' + ABC = (A'BC)'(AB'C)'(ABC)'(ABC)$$

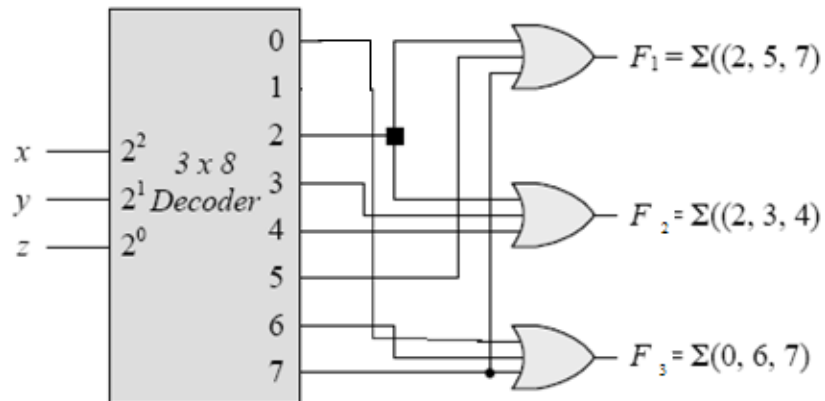


(a)

$$F_1 = x(y + y')z + x'yz' = xyx + xy'z + x'yz' = \Sigma(2, 5, 7)$$

$$F_2 = xy'z' + x'y = xy'z' + x'yz + x'yz' = \Sigma(2, 3, 4)$$

$$F_3 = x'y'z' + xy(z + z') = x'y'z' + xyz + xyz' = \Sigma(0, 6, 7)$$

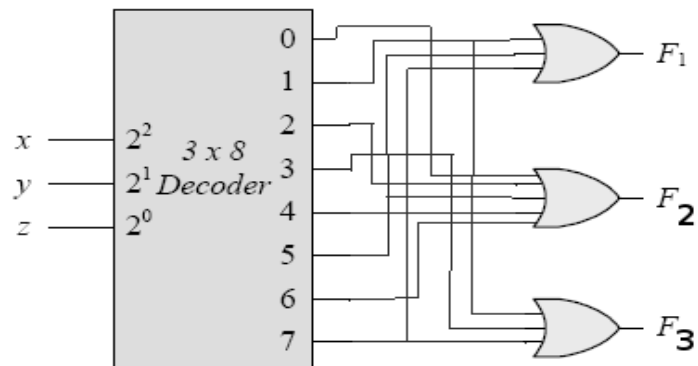


(b)

$$F_1 = (Y'+X)Z = X'Y'Z + XY'Z + XYZ$$

$$F_2 = Y'Z' + XY' + YZ' = XY'Z' + X'Y'Z' + XY'Z + XY'Z' + X'YZ'$$

$$F_3 = (X'+Y)Z = X'YZ + X'Y'Z + XYZ$$



4.33

$$S(x, y, z) = \Sigma(1, 2, 4, 7)$$

$$C(x, y, z) = \Sigma(3, 5, 6, 7)$$

S	I_0	I_1	I_2	I_3	C	I_0	I_1	I_2	I_3
x'	0	1	2	3	x'	0	1	2	3
x	4	5	6	7	x	4	5	6	7
	x	x'	x'	x		0	x'	x'	1

