ITI1500
Devoir # 4
SOLUTIONS

4.1 -solution-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 $A + A'BD' = A + BD'$:

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

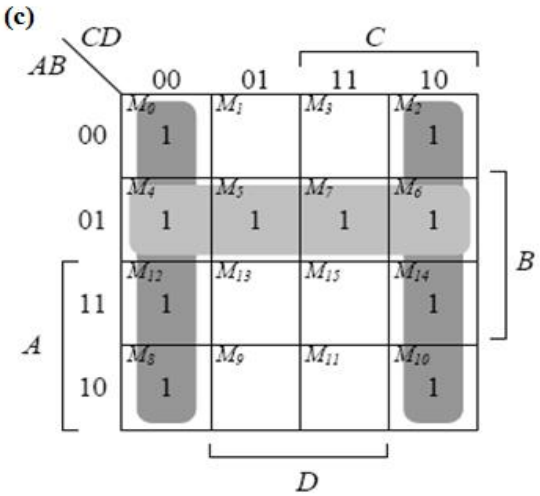
Alternative cover: $F_1 = A + CD' + BD' + B'D$

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

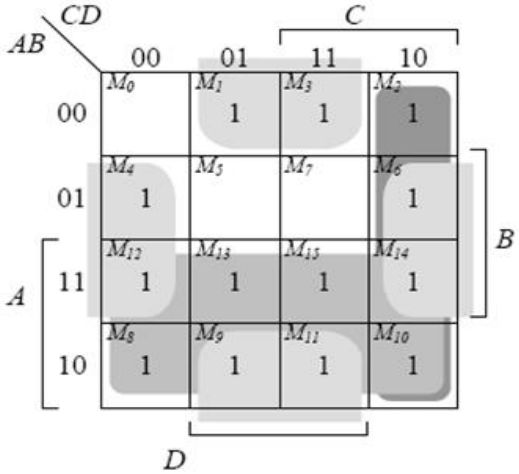
(b)

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

(c)



$F_2 = A'B + D'$



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

4.1 Solution 2

a)

$T_1 = B'C$

$T_2 = A'B$

$T_3 = T_1 + A = B'C + A$

$T_4 = T_2 \oplus D = A'B \oplus D = AD + B'D + A'BD'$

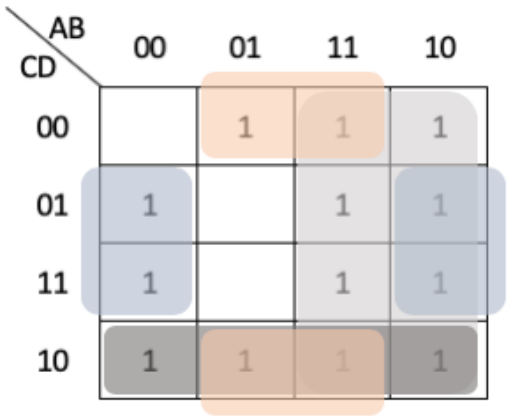
$F_1 = T_3 + T_4 = B'C + B'D + A + BD'$ ou $F_1 = A + CD' + B'D + BD'$

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

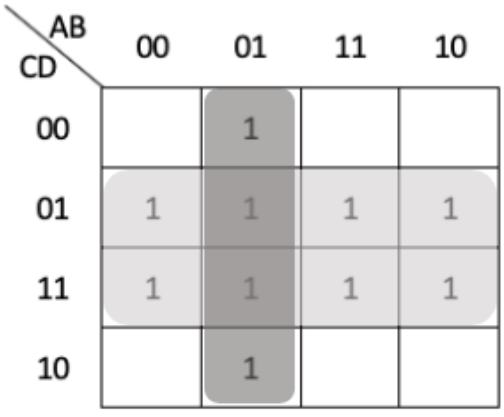
b)

ABCD	T_1	T_2	T_3	T_4	F_1	F_2
0000	0	0	0	0	0	0
0001	0	0	0	1	1	1
0010	1	0	1	0	1	0
0011	1	0	1	1	1	1
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	0
1001	0	0	1	1	1	1
1010	1	0	1	0	1	0
1011	1	0	1	1	1	1
1100	0	0	1	0	1	0
1101	0	0	1	1	1	1
1110	0	0	1	0	1	0
1111	0	0	1	1	1	1

c)



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



$F_2 = A'B + D$

4.5

x	y	z	A	B	C
0	0	0	0	0	1
0	0	1	0	1	0
0	1	0	0	1	1
0	1	1	1	0	0
1	0	0	0	1	0
1	0	1	0	1	1
1	1	0	1	0	0
1	1	1	1	0	1

$$\begin{aligned} A &= x'yz + xyz' + xyz \\ &= x'yz + xy(z' + z) \\ &= x'yz + xy(1) \end{aligned}$$

$$A = y(x'z + x)$$

$$\begin{aligned} A &= y(x' + x)(z + x) \\ &= y(1)(z + x) \end{aligned}$$

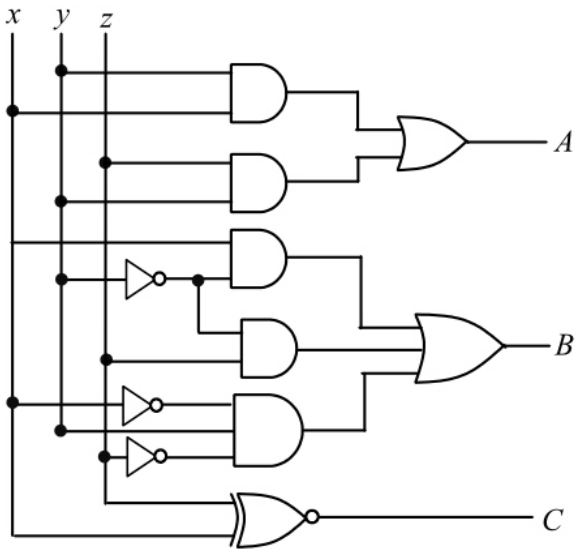
$$A = xy + yz$$

$$\begin{aligned} B &= x'y'z + x'yz' + xy'z' + xy'z \\ &= x'y'z + x'yz' + xy'z' + xy'z + xy'z \\ &= (x' + x)y'z + x'yz' + xy'(z' + z) \\ &= (1)y'z + x'yz' + xy'(1) \end{aligned}$$

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

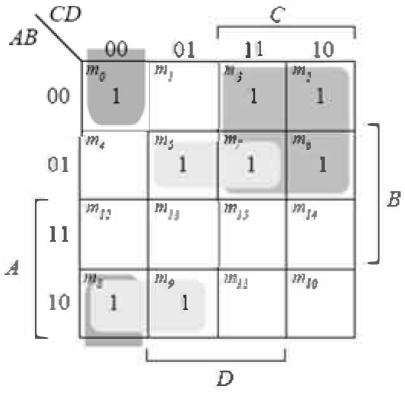
$$\begin{aligned} C &= x'y'z' + x'yz' + xy'z + xyz \\ &= x'z'(y' + y) + xz(y' + y) \\ &= x'z'(1) + xz(1) \\ &= x'z' + xz \end{aligned}$$

$$C = (x \oplus z)'$$

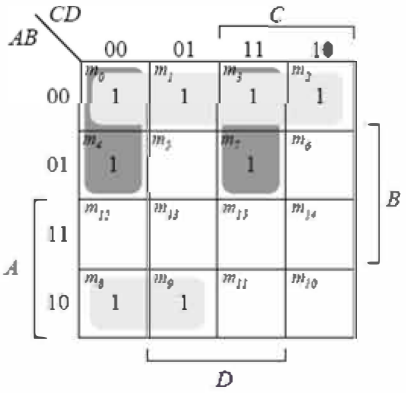


4.9

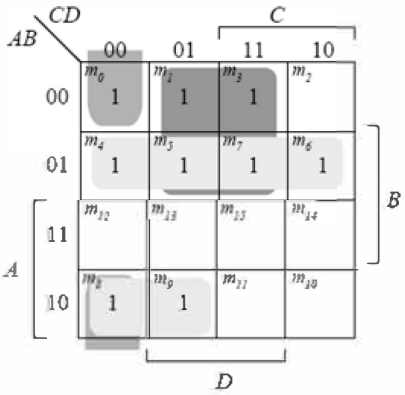
ABCD	a	b	c	d	e	f	g
0000	1	1	1	1	1	1	0
0001	0	1	1	0	0	0	0
0010	1	1	0	1	1	0	1
0011	1	1	1	1	0	0	1
0100	0	1	1	0	0	1	1
0101	1	0	1	1	0	1	1
0110	1	0	1	1	1	1	1
0111	1	1	1	0	0	0	0
1000	1	1	1	1	1	1	1
1001	1	1	1	1	0	1	1



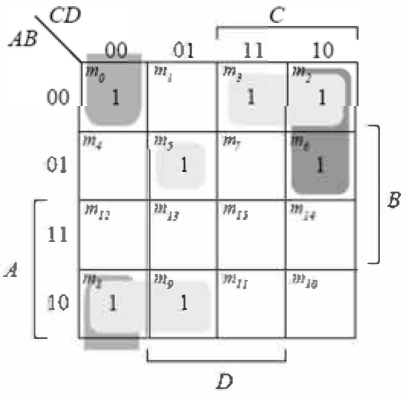
a=A'C+A'BD+AB'C'+A'B'D' or $a = A'C + A'BD + B'C'D' + AB'C'$



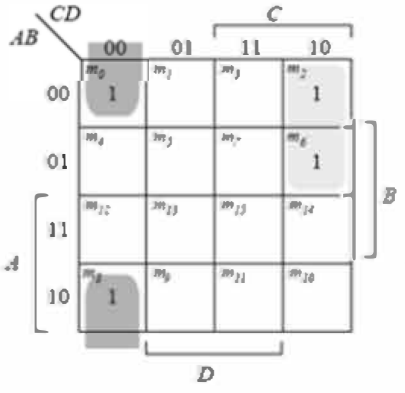
b=A'B'+B'C'+A'C'D'+A'CD



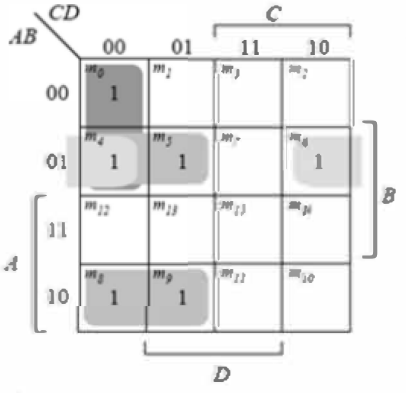
c=A'B+A'D+B'C'



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

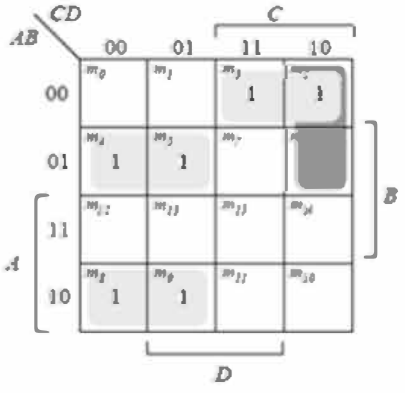


$e = A'CD' + B'C'D'$



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

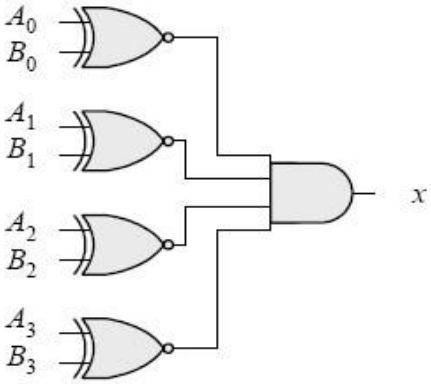
or f=A'BC'+AB'C'+A'BD'+B'C'D'



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

or g=A'BC'+AB'C'+A'B'C+A'BD'

4.21



$$x = (A \oplus B)'$$

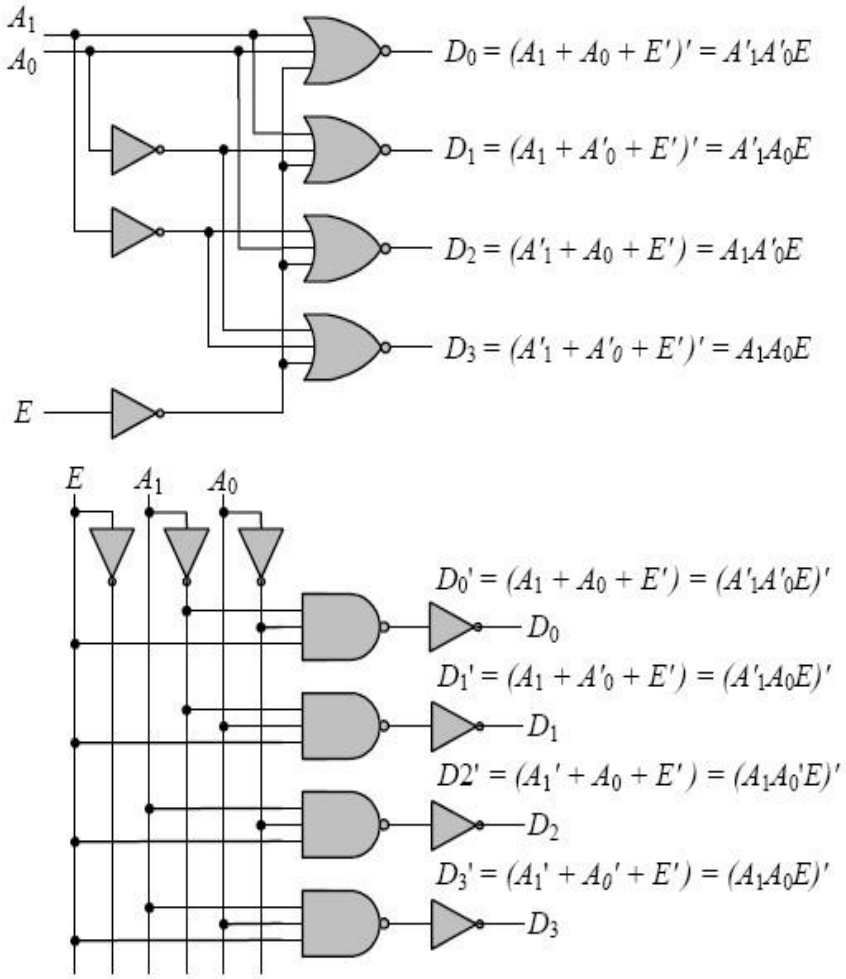
A	B	x
0	0	1
0	1	0
1	0	0
1	1	1

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

4.23

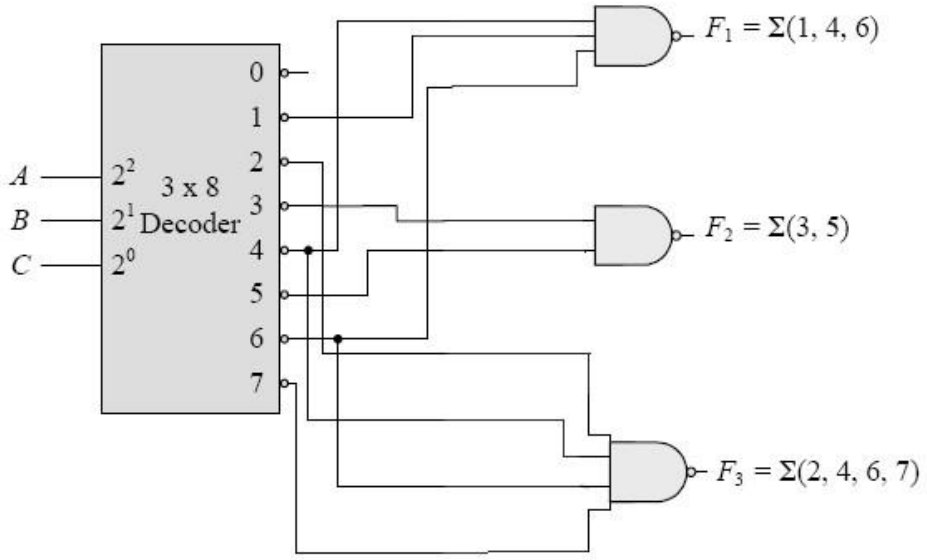
D0 = A1'A0'E=(A1+A0+E')' [NOR]
D1 = A1'A0E=(A1+A0'+E')' [NOR]
D2 = A1A0'E=(A1'+A0+E')' [NOR]
D3 = A1A0E=(A1'+A0'+E')' [NOR]

D0' = (A1'A0'E)' [NAND]
D1' = (A1'A0E)' [NAND]
D2' = (A1A0'E)' [NAND]
D3' = (A1A0E)' [NAND]



4.27

F1(A,B,C)=∑(1,4,6) = A'B'C+AB'C'+ABC' = (A'B'C)'(AB'C')'(ABC')')'
F2(A,B,C)=∑(3,5) = A'BC + AB'C = ((A'BC)'(AB'C)')'
F3(A,B,C)=∑(2,4,6,7) = A'BC'+AB'C'+ABC'+ABC = ((A'BC')'(AB'C')'(ABC')'(ABC)')'



4.28

a)

$$
\begin{aligned}
F_1(x,y,z) &= x'yz'+xz \\
&= x'yz'+xz(y+y') \\
&= x'yz'+xy'z+xyz \\
&= m_2+m_5+m_7
\end{aligned}
$$

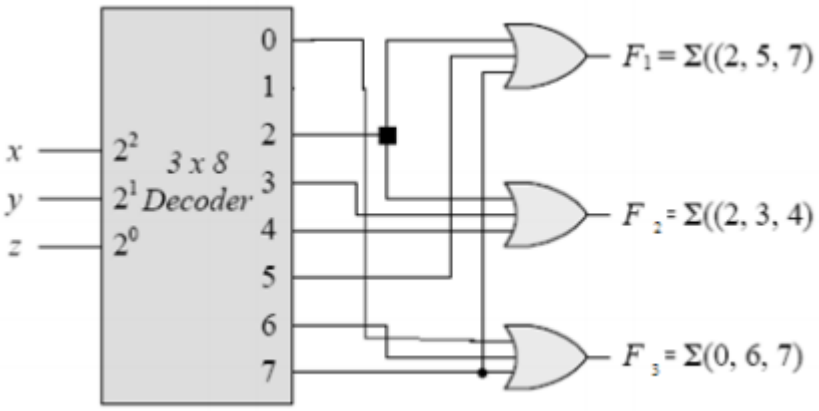
$$F_1(x,y,z)=\sum(2,\ 5,\ 7)$$

$$
\begin{aligned}
F_2(x,y,z) &= xy'z'+x'y \\
&= xy'z'+x'y(z+z') \\
&= xy'z'+x'yz'+x'yz \\
&= m_4+m_2+m_3
\end{aligned}
$$

$$F_2(x,y,z)=\sum(2,\ 3,\ 4)$$

$$
\begin{aligned}
F_3(x,y,z) &= x'y'z'+xy \\
&= x'y'z'+xy(z+z') \\
&= x'y'z'+xyz'+xyz \\
&= m_0+m_6+m_7
\end{aligned}
$$

$$F_3(x,y,z)=\sum(0,\ 6,\ 7)$$



b)

$$
\begin{aligned}
F_1(x,y,z) &= (y'+x)z \\
&= y'z+xz \\
&= (x+x')y'z+x(y+y')z \\
&= xy'z+x'y'z+xyz+xy'z \\
&= m_5+m_1+m_7+m_5
\end{aligned}
$$

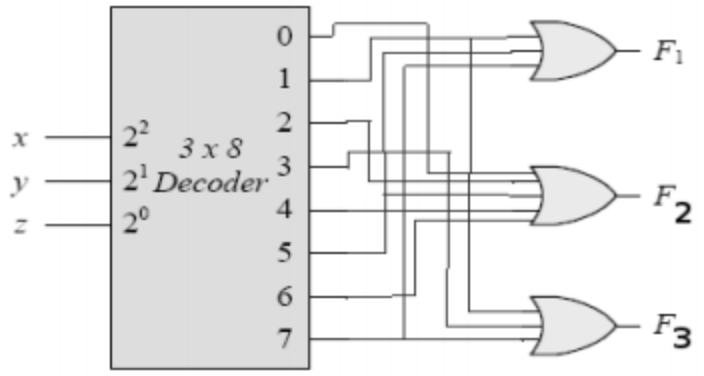
$$F_1(x,y,z)=\sum(1,\ 5,\ 7)$$

$$
\begin{aligned}
F_2(x,y,z) &= y'z'+x'y+yz' \\
&= (x+x')y'z'+x'y(z+z')+(x+x')yz' \\
&= xy'z'+x'y'z'+x'yz+x'yz'+xyz'+x'yz' \\
&= m_4+m_0+m_3+m_2+m_3+m_2
\end{aligned}
$$

$$F_2(x,y,z)=\sum(0,\ 2,\ 3,\ 4,\ 6)$$

$$
\begin{aligned}
F_3(x,y,z) &= (x+y)z \\
&= xz+yz \\
&= x(y+y')z+(x+x')yz \\
&= xyz+xy'z+xyz+x'yz \\
&= m_7+m_5+m_7+m_3
\end{aligned}
$$

$$F_3(x,y,z)=\sum(3,\ 5,\ 7)$$


x
y
z
2^2
2^1
2^0
3 x 8
Decoder
0
1
2
3
4
5
6
7
F_1
F_2
F_3