ITI1100B&C

Professor: Qi Hao

Assignment # 4

Submission Deadline March 6, 2017 midnight (11h59 PM), BlackBoard Learn

From the textbook Chapter four pages from 182 to 189, solve the following problems:

4.1, 4.5, 4.9, 4.21, 4.23, 4.24, 4.27, 4.28(b), 4.32(b), 4.33

4.1

Total 6 points

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

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

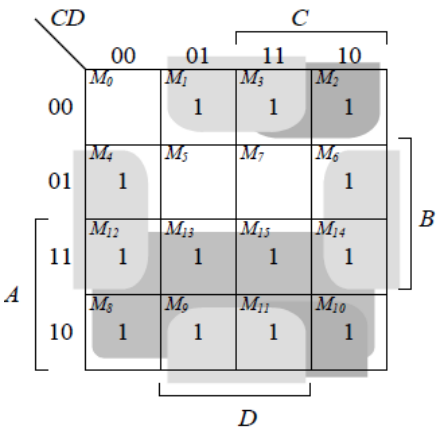
2 points

(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

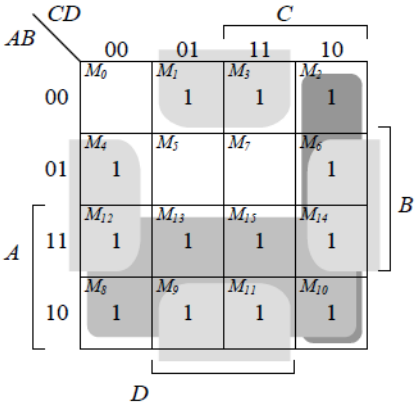
2 points

(c)

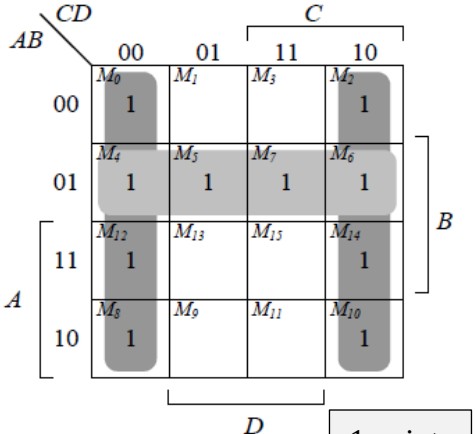


$F_1 = A + B'C + B'D + BD'$

1 points



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



$F_2 = A'B + D'$

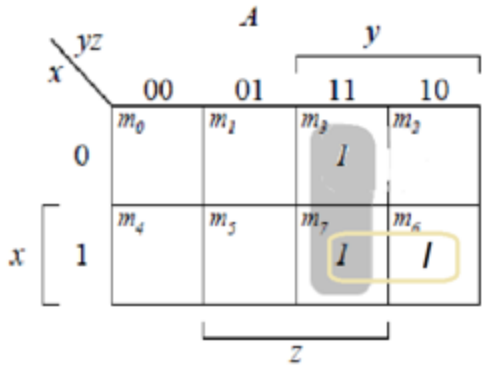
1 points

4.5

Total 5 points

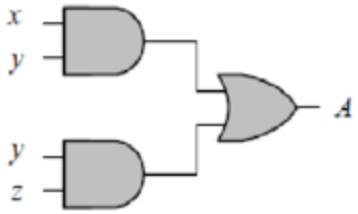
1 points

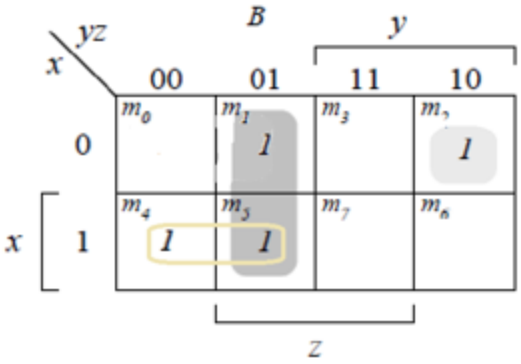
xyz	ABC
000	001
001	010
010	011
011	100
100	010
101	011
110	100
111	101



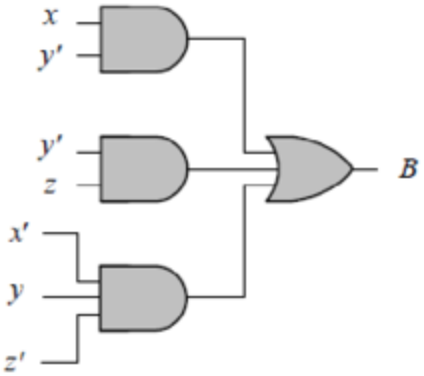
$A = xy + yz$

1.5 points

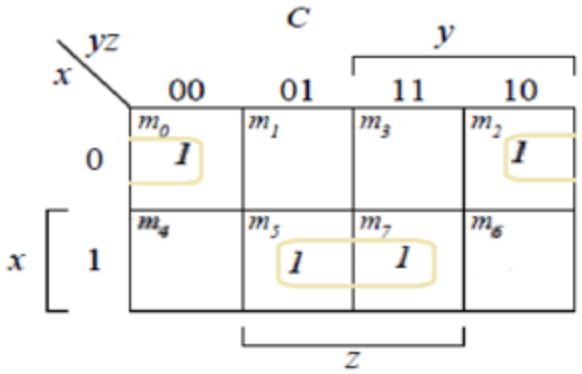




$B = xy' + y'z + x'yz'$



1.5 points



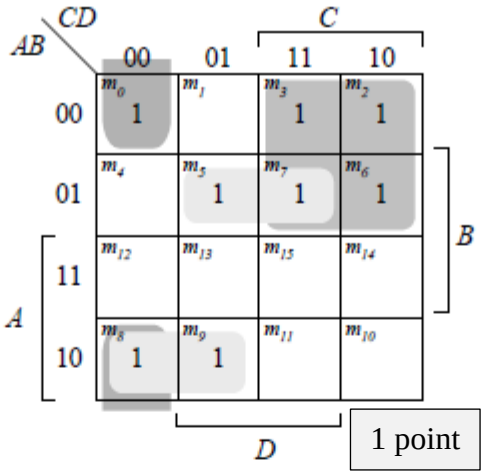
$C = x'z' + xz$

1 point

4.9 Total 8 points

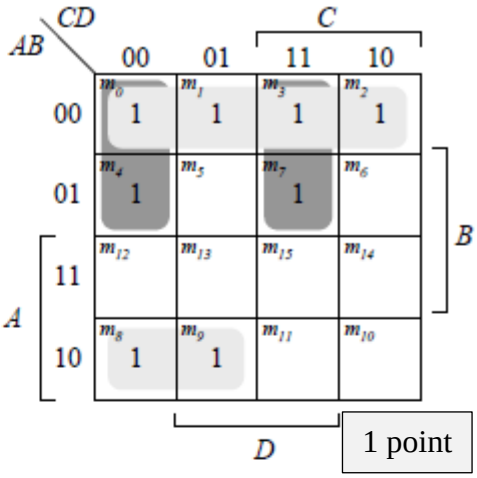
ABCD	a	b	c	d	e	f	g
0000	1	1	1	1	1	1	0
0001	0	1	1	0	0	0	0
0010	1	1	0	1	1	0	1
0011	1	1	1	1	0	0	1
0100	0	1	1	0	0	1	1
0101	1	0	1	1	0	1	1
0110	1	0	1	1	1	1	1
0111	1	1	1	0	0	0	0
1000	1	1	1	1	1	1	1
1001	1	1	1	1	0	1	1

1 points



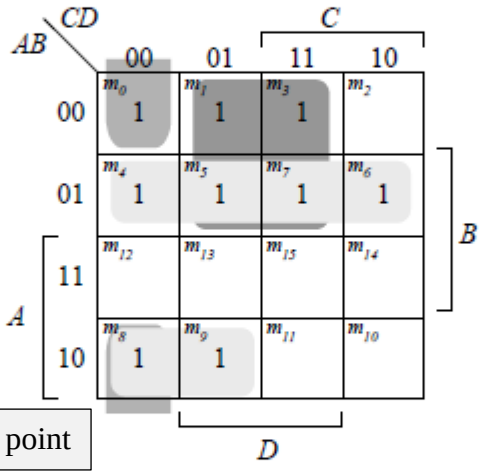
1 point

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



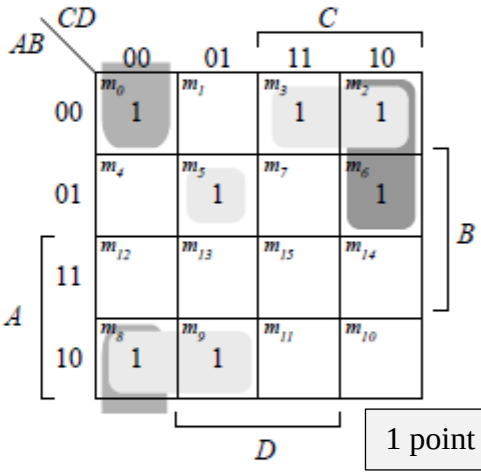
1 point

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



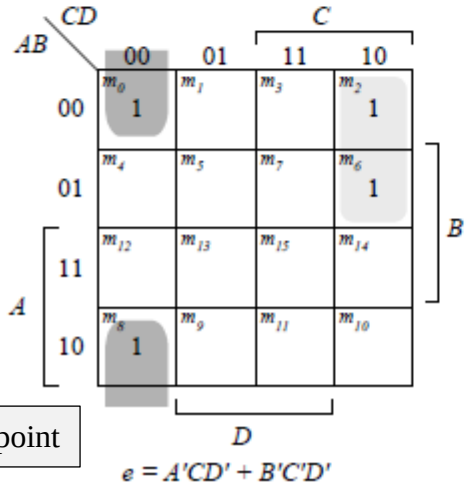
1 point

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



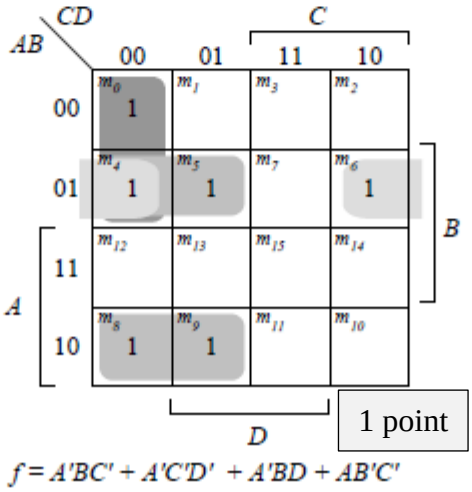
1 point

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



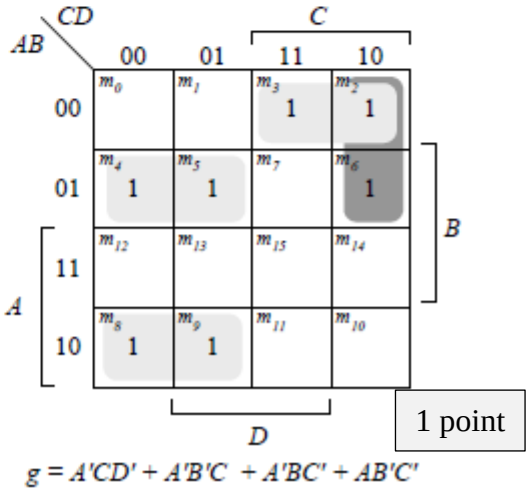
1 point

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



1 point

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



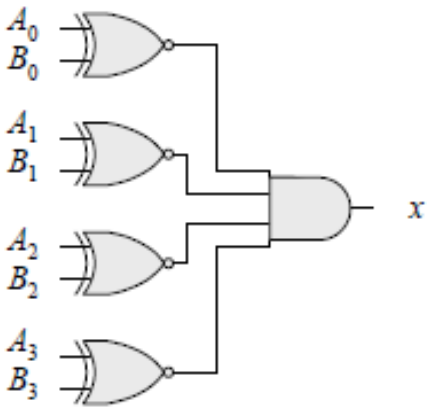
1 point

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

Error Corrections: $b = A'B' + A'C'D' + A'CD + B'C'$ $c = A'B + A'D + B'C'$
$f = A'BC' + A'C'D' + A'BD' + AB'C'$

4.21

2 points

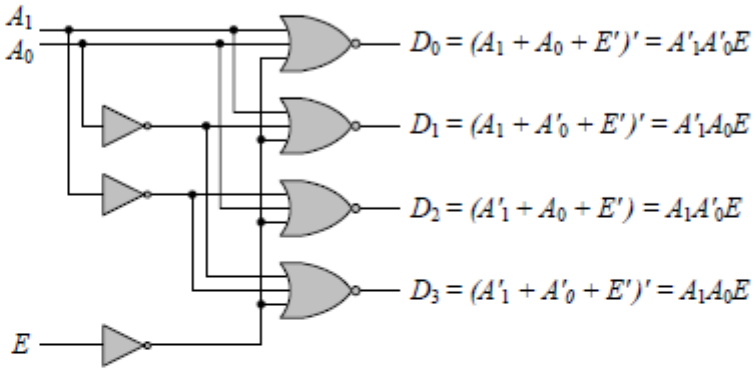


$$x = (A_0 \oplus B_0)'(A_1 \oplus B_1)'(A_2 \oplus B_2)'(A_3 \oplus B_3)'$$

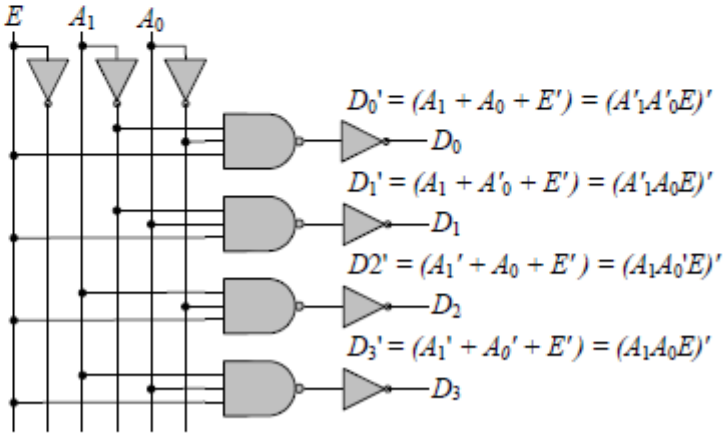
4.23

Total
4 points

D0 = A1'A0' = (A1 + A0)'	(NOR)	D0' = (A1'A0')'	(NAND)
D1 = A1'A0 = (A1 + A0')'	(NOR)	D1' = (A1'A0)'	(NAND)
D2 = A1A0' = (A1' + A0)'	(NOR)	D2' = (A1A0')'	(NAND)
D3 = A1A0 = (A1' + A0)'	(NOR)	D0' = (A1A0)'	(NAND)



2 points



2 points

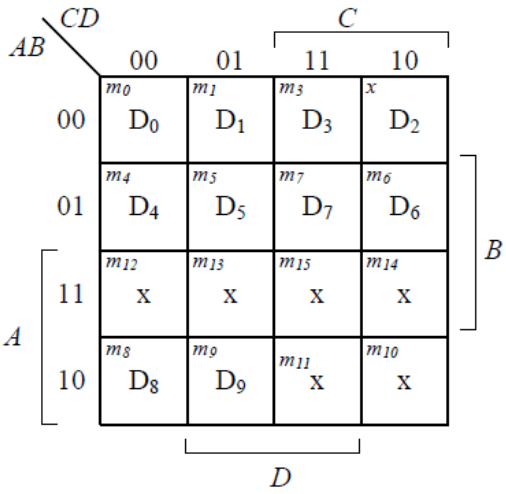
4.24

Total
2 points

Inputs: *A, B, C, D*

$D_0 = A'B'C'D'$
$D_1 = A'B'C'D$
$D_2 = B'CD'$
$D_3 = B'CD$
$D_4 = BC'D'$

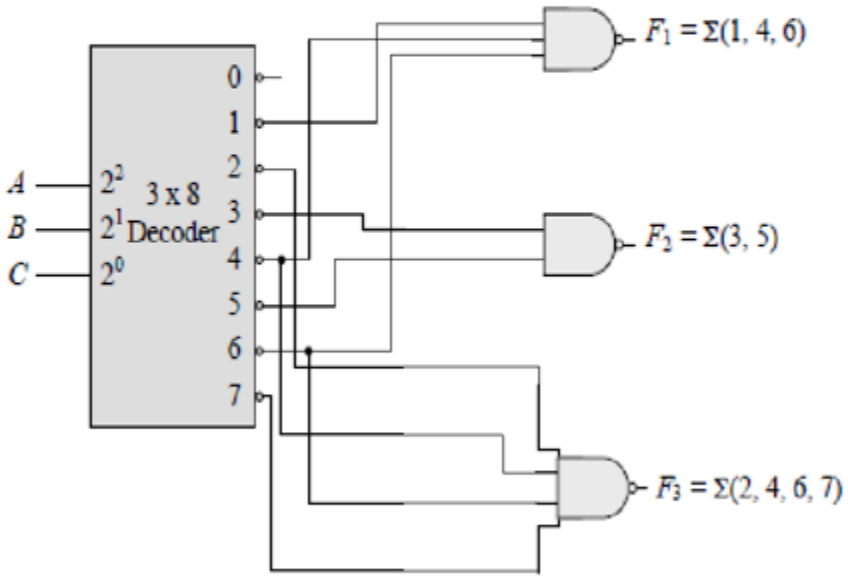
Outputs: $D_0, D_1, \ldots D_9$
$D_5 = BC'D$
$D_6 = BCD'$
$D_7 = BCD$
$D_8 = AD'$
$D_9 = AD$



Total
3 points

4.27

1 point



1 point

1 point

4.28(b)

Total
3 points

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

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

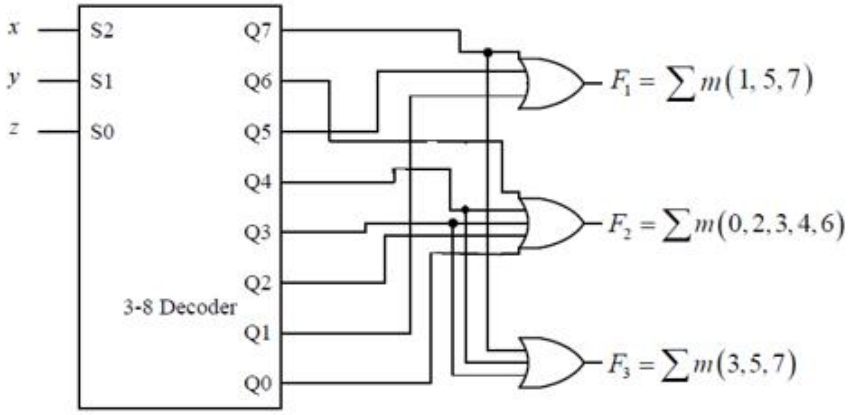
$= xy'z' + x'y'z + xyz = \sum m(1, 5, 7)$

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

$= x'y'z' + x'yz' + x'yz + xy'z' + xyz' = \sum m(0, 2, 3, 4, 6)$

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

$= x'yz + xy'z + xyz = \sum m(3, 5, 7)$

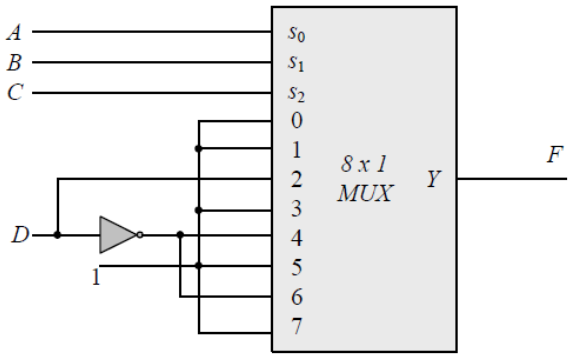


4.32 Total 3 points

(b)

$F = \Pi(2, 6, 11) = (A' + B' + C + D')(A' + B + C + D')(A + B' + C + D)$
$F' = (A' + B' + C + D')' + (A' + B + C + D')' + (A + B' + C + D)'$
$F' = (ABC'D) + (AB'C'D) + (A'BC'D') = \Sigma(13, 9, 4)$
$F = \Sigma(0, 1, 2, 3, 5, 6, 7, 8, 10, 11, 12, 14, 15)$

Inputs ABCD	Mux input line (ABC)	Value	
000 0	0	**0**	$_1^1 F = 1$
000 1	0	**1**	
001 0	1	**2**	$_1^1 F = 1$
001 1	1	**3**	
010 0	2	4	$_0^1 F = D$
010 1	2	**5**	
011 0	3	**6**	$_1^1 F = 1$
011 1	3	**7**	
100 0	4	**8**	$_1^0 F = D'$
100 1	4	9	
101 0	5	**10**	$_1^1 F = 1$
101 1	5	**11**	
110 0	6	**12**	$_1^0 F = D'$
110 1	6	13	
111 0	7	**14**	$_1^1 F = 1$
111 1	7	**15**	



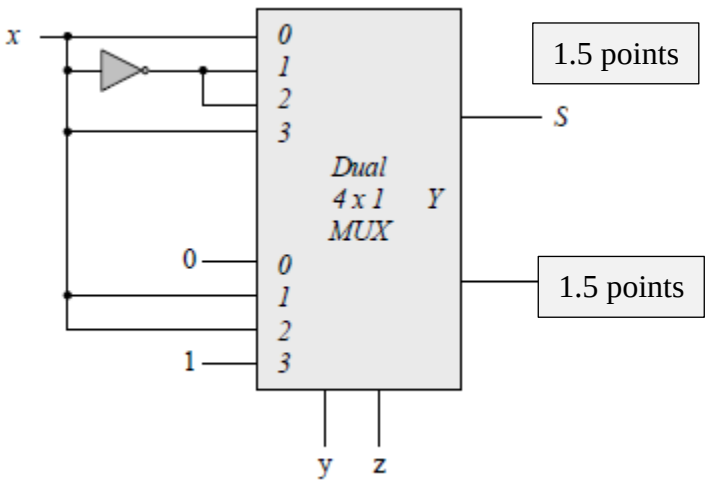
4.33 1 point

Total 4 points

$S(x, y, z) = \Sigma(1, 2, 4, 7)$
$C(x, y, z) = \Sigma(3, 5, 6, 7)$

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

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



1.5 points

1.5 points