Solution II

2-1 a) $(XYZ)' = X' + Y' + Z'$
Verification of DeMorgan's Theorem

X	Y	Z	XYZ	$(XYZ)'$	$X'+Y'+Z'$
0	0	0	0	1	1
0	0	1	0	1	1
0	1	0	0	1	1
0	1	1	0	1	1
1	0	0	0	1	1
1	0	1	0	1	1
1	1	0	0	1	1
1	1	1	1	0	0

2-2 a) $AB + AB' + A'B'$
$= (AB + AB') + (AB' + A'B')$
$= A(B + B') + B'(A + A')$
$= A + B'$

2-3 a) $AB' + A'C'D' + A'B'D + A'B'CD'$
$= AB' + A'BC'D' + A'B'C'D' + A'B'CD' + A'B'CD + A'B'C'D$
$= AB' + (A'BC'D' + A'B'C'D') + (A'B'C'D' + A'B'C'D) + (A'B'CD' + A'B'CD)$
$= AB' + A'C'D' + (A'B'C' + A'B'C)$
$= AB' + A'B' + A'C'D'$
$= B' + A'C'D'$

2-4 Step 1: Define all elements of the algebra as eight bit vectors such as A, B, and C:

$A = (A_7, A_6, A_5, A_4, A_3, A_2, A_1, A_0)$
$B = (B_7, B_6, B_5, B_4, B_3, B_2, B_1, B_0)$
$C = (C_7, C_6, C_5, C_4, C_3, C_2, C_1, C_0)$

Step 2: Define OR_1, AND_1 and NOT_1 so that they conform to the definitions of OR, AND and NOT presented in Table 2-1.

a) $A + B = C$ is defined such that for all i, $i = 0,\ldots,7$, C_i equals the OR_1 of A_i and B_i .
b) $A\,B = C$ is defined such that for all i, $i = 0,\ldots,7$, C_i equals the AND_1 of A_i and B_i .
c) The element 0 is defined such that for A = "0", for all i, $i = 0,\ldots,7$, A_i equals logical zero.
d) The element 1 is defined such that for A = "1", for all i, $i = 0,\ldots,7$, A_i equals logical one.
e) For any element A, A' is defined such that for all i, $i = 0,\ldots,7$, A_i' equals the NOT_1 of A_i.

2-5 a) $ABC + ABC' + A'B = AB(C + C') + A'B = B(A + A') = B$

2-6 a) $X'Y' + XYZ + X'Y = X' + XYZ = (X' + XY)(X' + Z)$
$= (X' + X)(X' + Y)(X' + Z) = (X' + Y)(X' + Z) = X' + YZ$

2-8 a) $F' = (A' + B)(A + B')$

2-9 a) Truth Tables a, b, c

X	Y	Z	a
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

A	B	C	b
0	0	0	1
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

W	X	Y	Z	c
0	0	0	0	0
0	0	0	1	0
0	0	1	0	1
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	1
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0
1	0	1	0	1
1	0	1	1	0
1	1	0	0	1
1	1	0	1	1
1	1	1	0	1
1	1	1	1	1

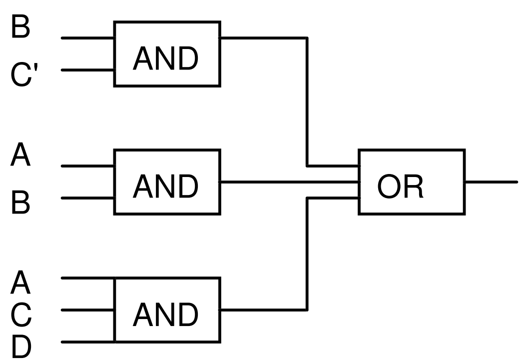
Sum of Minterms: $X'YZ + XY'Z + XYZ' + XYZ$

Product of Maxterms: $(X + Y + Z)(X + Y + Z')(X + Y' + Z)(X' + Y + Z)$

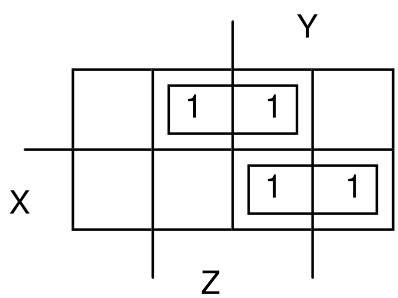
2-11 a) $(AB + C)(B + C'D) = AB + BC + ABC'D = AB + BC$ s.o.p.

$= B(A + C)$ p.o.s.

2-12 a)

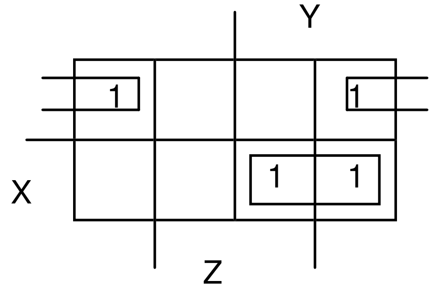


2-13 a)



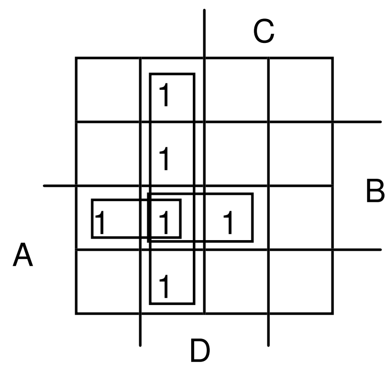
$X'Z + XY$

2-14 a)



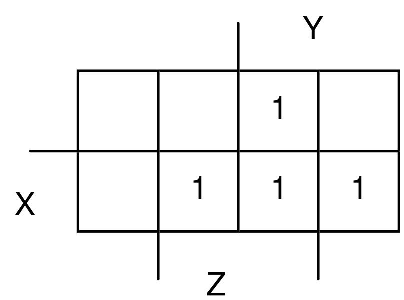
X' Z' + XY

2-15 a)



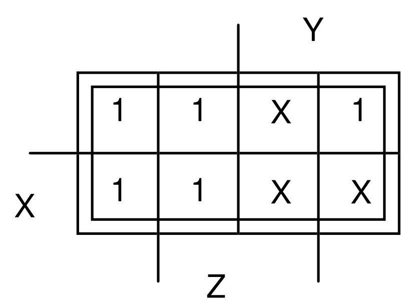
C' D + ABC' + ABD

2-17a)



Σm (3, 5, 6, 7)

2-22 a)



F = 1