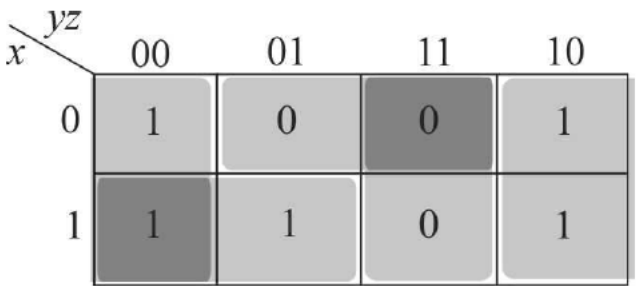
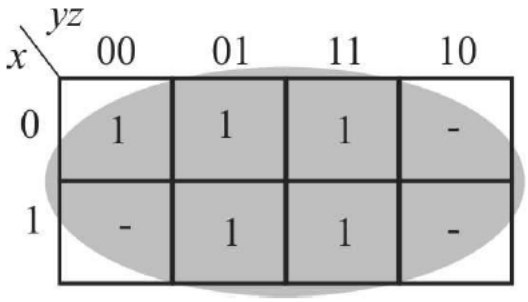
3.13 **(a)** $F = xz' + y'z' + yz' + xy' = \Sigma(0, 2, 4, 5, 6)$



x \ yz	00	01	11	10
0	1	0	0	1
1	1	1	0	1

$F = z' + xy'$ (Sum of Product)
$F = (x + z')(y' + z')$ (Product of Sum)

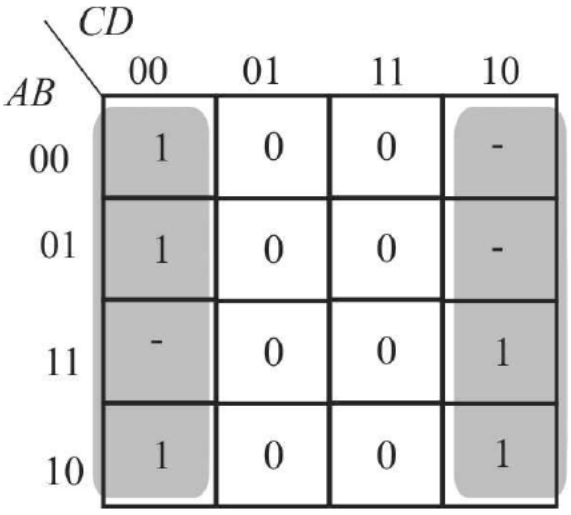
3.15 **(a)** $F(x, y, z) = \Sigma(0, 1, 3, 5, 7)$
$d = \Sigma(2, 4, 6)$



x \ yz	00	01	11	10
0	1	1	1	-
1	-	1	1	-

$F = 1$

(b) $F = \Sigma(0, 4, 8, 10, 14)$
$d = \Sigma(2, 6, 12)$



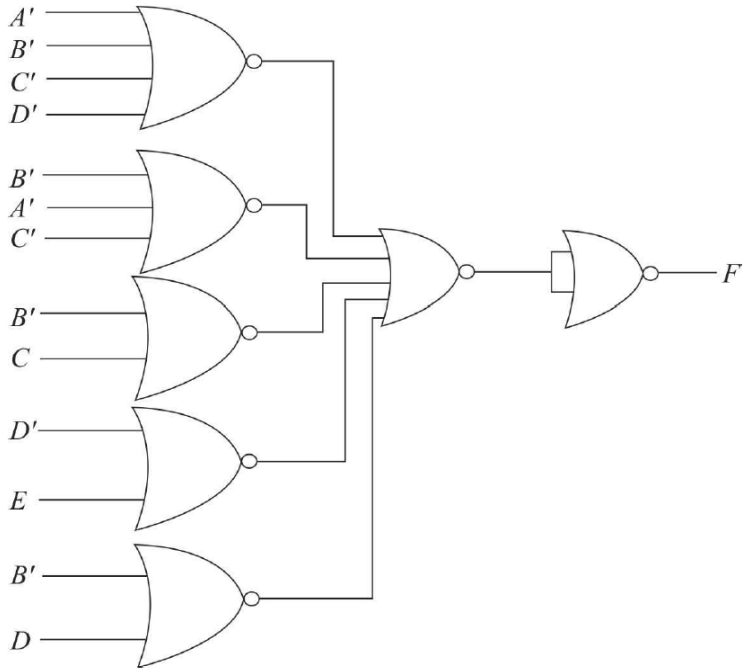
AB \ CD	00	01	11	10
00	1	0	0	-
01	1	0	0	-
11	-	0	0	1
10	1	0	0	1

$F = D'$

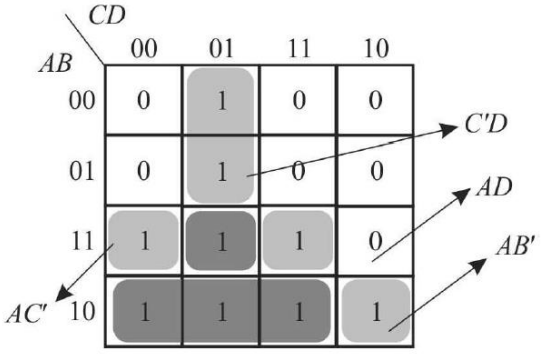
3.20 $F = BC(D + C)A + (BC' + DE') + BD'$

$= ABCD + ABC + BC' + DE' + BD'$

$= [[(A' + B' + C' + D')' + (A' + B' + C')' + (B' + C)' + (D' + E)' + (B' + D)']']'$



3.24 $F(A, B, C, D) = \Sigma(1, 5, 8, 9, 10, 11, 12, 13, 15)$



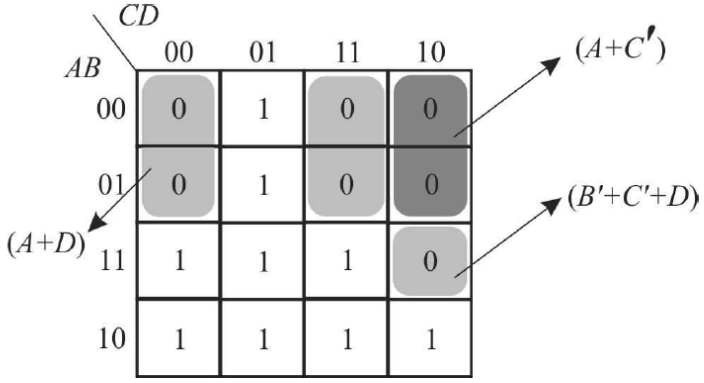
$F(A, B, C, D) = C'D + AB' + AC' + AD$ → **(a)** AND-OR

$= ((C'D)'(AB')'(AC')'(AD)')'$

$= ((C+D')(A'+B)(A'+C)(A'+D'))'$ →**(b)** OR-NAND

$= ((C + D')' + (A' + B)' + (A' + C)' + (A' + D')'$ →**(c)** NOR-OR

$= ((C'D)' (AB')' (AC')' (AD)')'$ →**(d)** NAND-NAND



$F(A, B, C, D) = (A + D)(A + C')(B' + C' + D)$ →**(e)** OR-AND

$= ((A + D)' + (A + C')' + (B' + C' + D')')'$ →**(f)** NOR-NOR

$= (A'D')' (A'C)' (BCD')'$ →**(g)** NAND-AND

3.26 $f = abc' + b'd' + a'd' + b'cd'$

ab \ cd	00	01	11	10
00	1	0	0	1
01	1	0	0	1
11	1	1	0	
10	1	0	0	1

$g = (a + b + c' + d')\ (a' + b' + d)\ (a' + d')$

ab \ cd	00	01	11	10
00	1	1	0	1
01	1	1	1	1
11	0	0	0	0
10	1	0	0	1

Group the overlapping is

$F = fg = \Sigma(0, 2, 4, 5, 8, 10)$

ab \ cd	00	01	11	10
00	1	0	0	1
01	1	0	0	1
11	0	0	0	0
10	1	0	0	1

$F = a'd' + b'd'$