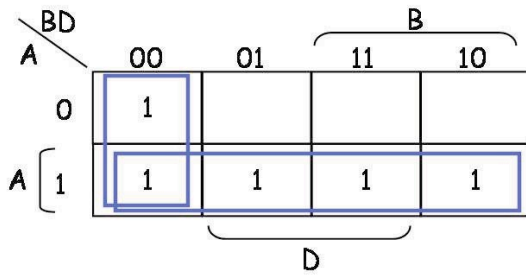


# INF2270 - Ukeoppgaver 2- FASIT

1. Forenkle følgende uttrykk med Karnaugdiagram:

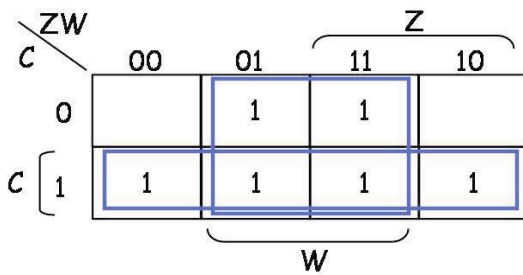
a)  $BA + D'B' + DB'A$

$F = D'B' + A$



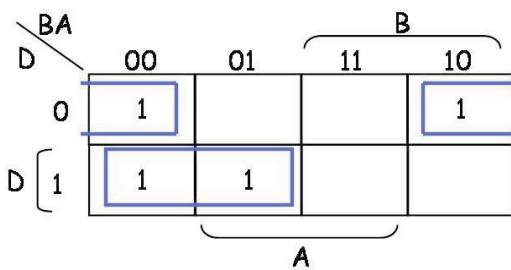
b)  $CZ + Z'W + CW' + C'ZW$

$F = C + W$



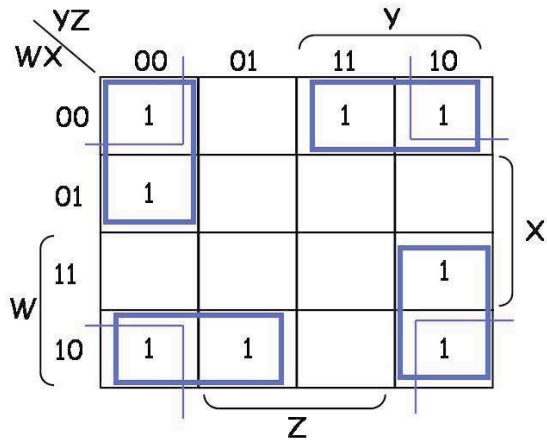
c)  $B'A' + D'A' + DB'A$

$F = D'A' + DB$



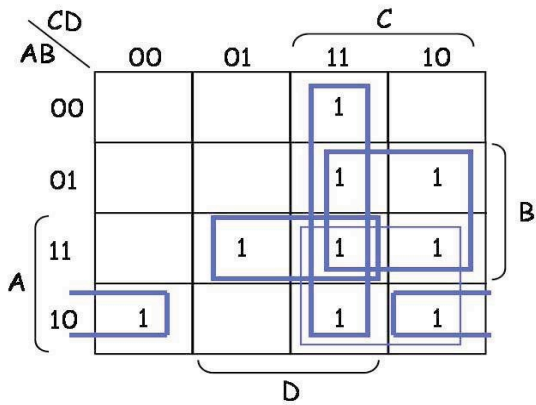
2.

a)  $F(W,X,Y,Z) = \text{Sum } m(0, 2, 3, 4, 8, 9, 10, 14)$



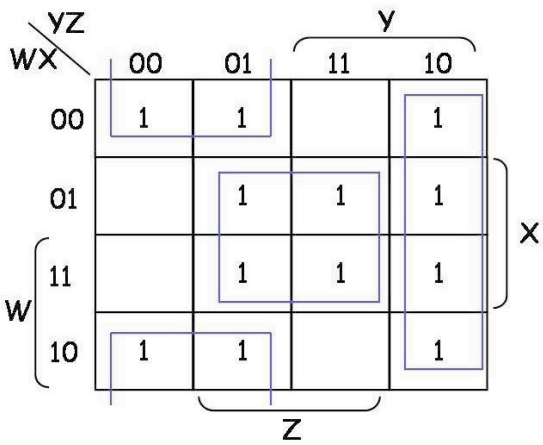
$$F = \bar{W}\bar{Y}\bar{Z} + \bar{W}\bar{X}Y + W\bar{X}\bar{Y} + WY\bar{Z}$$

b)  $F(A,B,C,D) = \text{Sum } m(3, 6, 7, 8, 10, 11, 13, 14, 15)$



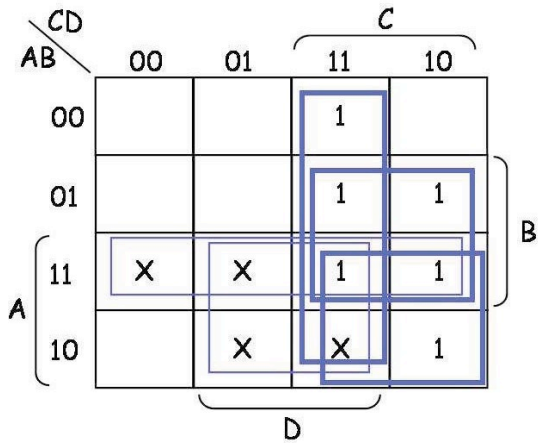
$$F = CD + BC + ABD + A\bar{B}\bar{D}$$

c)  $F(W,X,Y,Z) = \text{Sum } m(0, 1, 2, 5, 6, 7, 8, 9, 10, 13, 14, 15)$



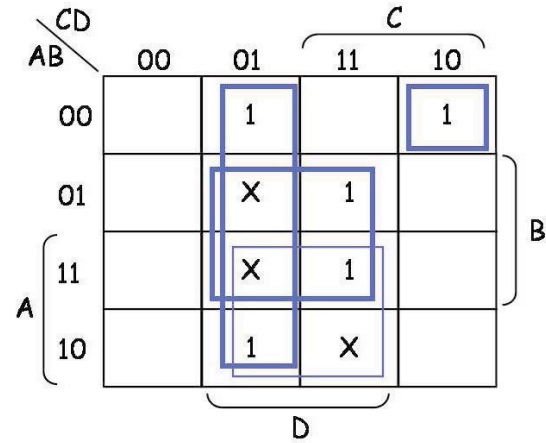
$$F = \bar{X}\bar{Y} + XZ + Y\bar{Z}$$

3a)  $F(A,B,C,D) = \text{Sum } m(3, 6, 7, 10, 14, 15)$ , don't-care:  $d(A,B,C,D) = \text{Sum } m(9, 11, 12, 13)$



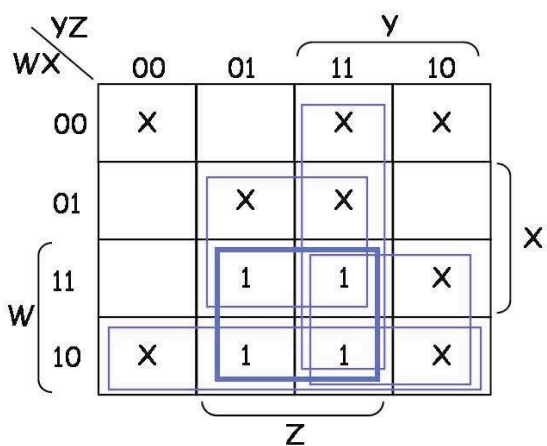
$$F = CD + BC + AC$$

3b)  $F(A,B,C,D) = \text{Sum } m(1, 2, 7, 9, 15)$ , don't-care:  $d(A,B,C,D) = \text{Sum } m(5, 11, 13)$



$$F = \bar{C}D + BD + \bar{A}BC\bar{D}$$

3c)  $F(W,X,Y,Z) = \text{Sum } m(9, 11, 13, 15)$ , don't-care:  $d(W,X,Y,Z) = \text{Sum } m(0, 2, 3, 5, 7, 8, 10, 14)$



$$F = WZ$$

4. Forenkle følgende funksjonsuttrykk med en 4-variabels Karnaugh diagram:

$$F = wxy + yz + xy'z + x'y$$

		yz			
		00	01	11	10
wx	00			1	1
	01		1	1	
	11		1	1	1
	10			1	1

$$F = xz + x'y + wy$$

5. Gitt

$$F(A, B, C, D) = \text{SUM}(0, 4, 5, 7, 8, 12, 13, 15)$$

$$G(A, B, C, D) = \text{II}(0, 1, 7, 8, 9, 10, 11, 12, 15)$$

$$F(A, B, C, D) = \text{SUM}(0, 4, 5, 7, 8, 12, 13, 15) \text{ CD}$$

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

$$G(A, B, C, D) = \text{II}(0, 1, 7, 8, 9, 10, 11, 12, 15)$$

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

(a) Forenklet  $F \cdot G$

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

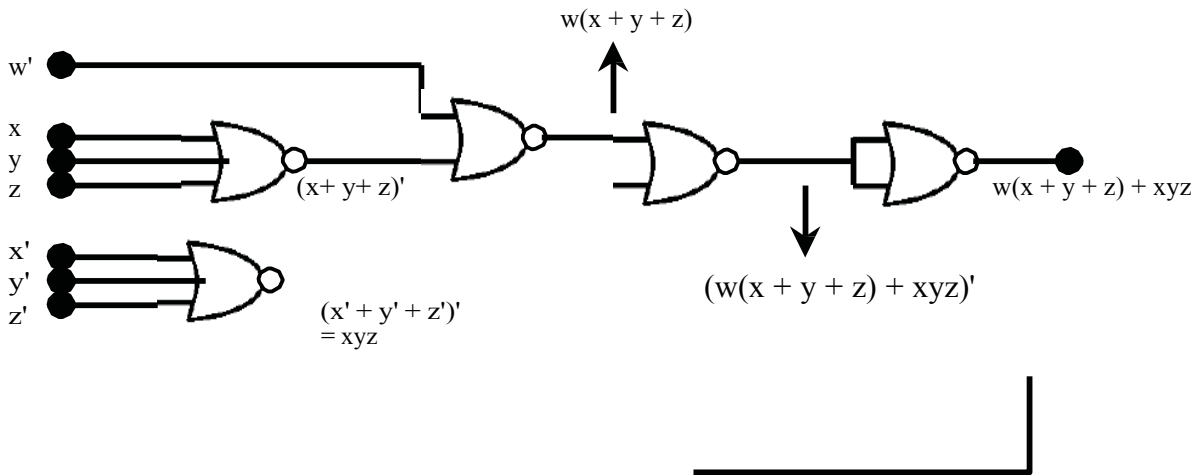
$$F \cdot G = A'BC' + BC'D$$

(b) Forenklet  $F+G$

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

$$F+G = B + C'D' + A'C$$

6. Tegn følgende uttrykk med NOR porter:  $F = w(x + y + z) + xyz$ .



7. Design a combinational circuit with three inputs x, y and z, and three outputs A, B and C. When the binary input is 0, 1, 2 and 3, the binary output is one greater than the input. When the binary input is 4, 5, 6 and 7, the binary output is one less than the input.

First, we need to find the truth table for the circuit:

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	1
1	0	1	1	0	0
1	1	0	1	0	1
1	1	1	1	1	0

Now Find the Boolean Function for output A, B and C

For Output A::

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

So, Output A =  $yz + xz + xy$

For Output B::

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

So, Output B =  $x'y'z + x'yz' + xy'z' + xyz = x'(y'z + yz') + x(y'z' + yz)$   
 $= x'(yEBz) + x(yEBz)' = xEB yEBz$

For Output C::

	00	01	11	10
x				
0	1	0	0	1
1	1	0	0	1

So, Output  $C = z'$

Designing Circuit from Boolean Equations::

