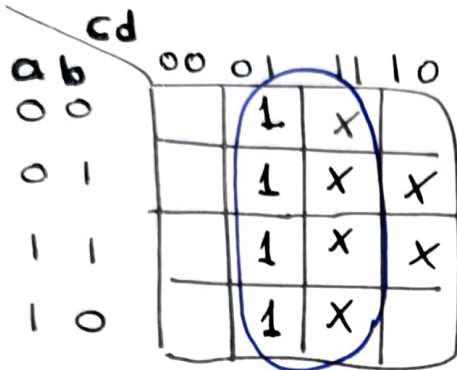




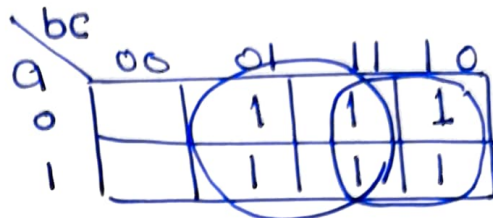
1. Simplify the function represented by Karnaugh map



$$F = d$$

2. Simplify the following Boolean function using Karnaugh map

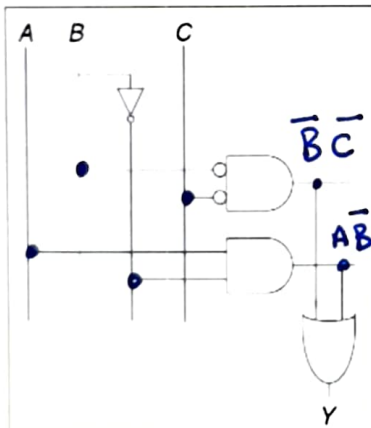
$$f(a, b, c) = \bar{a}c + ab + a\bar{b}c + \bar{a}b\bar{c}$$



$$f = c + b$$

3. Concerning the logic diagram shown:

- a) Find the **truth table** for the logic diagram shown below
b) Find the expression for the **Boolean function Y**



$$Y = \bar{B}\bar{C} + A\bar{B}$$

A	B	C	Y
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	0
1	1	1	0

4. Design a circuit that can accept a **2-bits number** and outputs the **square** of that number.

Assume Number A, A_0
 # input bits = 2 bit
 # Output bits = 4 bit

A_1	A_0	C_3	C_2	C_1	C_0
0	0	0	0	0	0
0	1	0	0	0	1
1	0	0	1	0	0
1	1	1	0	0	1

$C_0 = A_0$
 $C_1 = 0$
 $C_2 = A_1 A_0$
 $C_3 = A_1 A_0$

5. For the logic circuit shown below, write down the **Boolean equations** for outputs and then Construct the **truth table**

$D_0 = \overline{A} \overline{B} \overline{E}$
 $D_1 = \overline{A} B \overline{E}$
 $D_2 = A B \overline{E}$
 $D_3 = A B E$

A	B	E	D_0	D_1	D_2	D_3
0	0	0	1	0	0	0
0	0	1	0	0	0	0
0	1	0	0	1	0	0
0	1	1	0	0	0	0
1	0	0	0	0	1	0
1	0	1	0	0	0	0
1	1	0	0	0	0	1
1	1	1	0	0	0	1

6. Design a circuit to perform the **comparison** between two 2-bit numbers, if they are equal, the output will be one, otherwise the output will be zero

A_1	A_0	B_1	B_0	Equal = F
0	0	0	0	1
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	1
0	1	1	0	0
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	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	1

$F = \overline{A_1} \overline{A_0} \overline{B_1} \overline{B_0} + \overline{A_1} A_0 \overline{B_1} B_0 + A_1 \overline{A_0} B_1 \overline{B_0} + A_1 A_0 B_1 B_0$

OR

$F = (\overline{A_0} \oplus \overline{B_0}) \cdot (A_0 \oplus B_0)$

7. Express the function $F(A, B, C) = A + \bar{B}\bar{C}$ in a **standard** sum of products (SOP).

BC	00	01	11	10
A	0	1	1	1
	0	1	1	1
	1	1	1	1

$$F = \sum(0, 4, 5, 6, 7)$$

$$F = \bar{A}\bar{B}\bar{C} + A\bar{B}\bar{C} + A\bar{B}C + A\bar{B}\bar{C} + ABC$$

8. For the following function **with don't care conditions** in SOP form answer the following
 $f(A, B, C, D) = \sum(0, 3, 7, 10, 11, 13, 15)$, $d(A, B, C, D) = \sum(2, 4, 8)$
 Use a K-map to simplify the function in SOP.

CD	00	01	11	10
AB	00	1	1	X
	01	X	1	
	11	1	1	
	10	X	1	1

$$f = CD + \bar{B}\bar{D} + ABD$$