# Tecnológico Nacional de México

## Instituto Tecnológico de Querétaro

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| **Nombre del alumno:** | **Favian Orduña Suárez** |
| **Nombre de la actividad: Simplificar de expresiones usando algebra de boole o mapas de Karnaugh** | |
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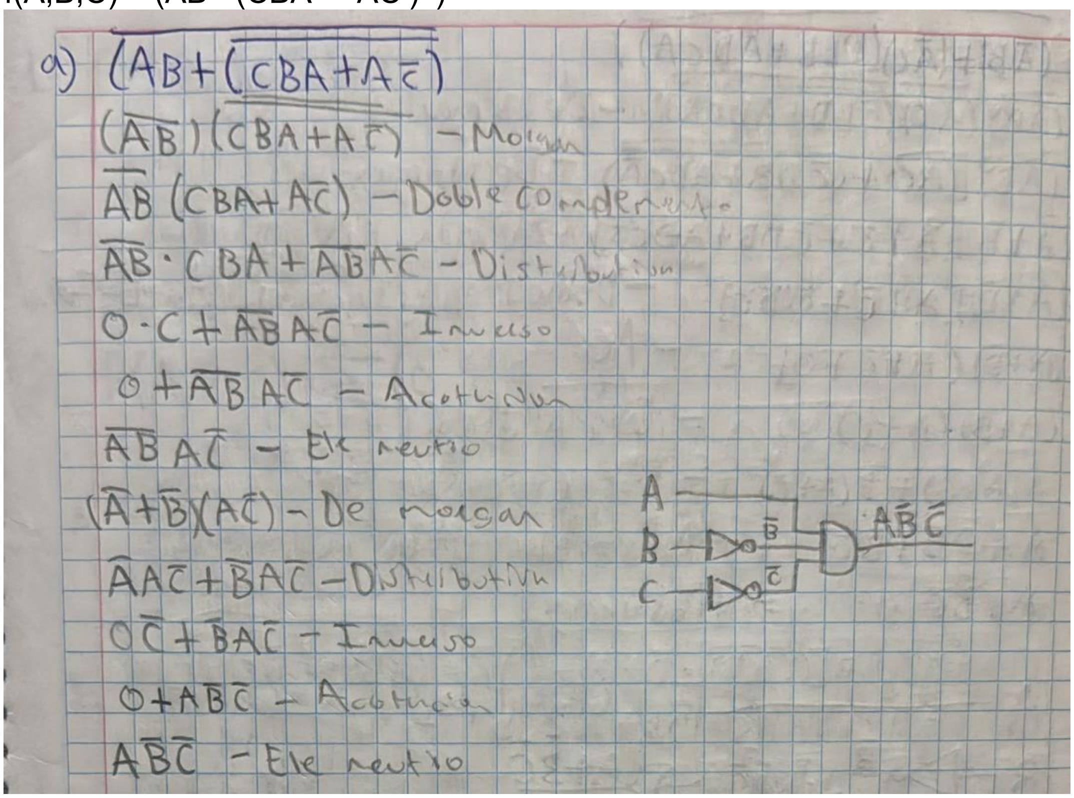
**4.1.** Utilizando Álgebra de Boole, reduce las siguientes funciones boolenas y elabora el diagrama de circuito lógico de la expresión simplificada

a) f(A,B,C) = (AB+ (CBA + AC’) ‘) ‘



b) f(A,B,C) = (AB + (A’C)’)’+ (AC’ B’ A)’

b) $\overline{(AB+\overline{(A'C)})} + \overline{(A\bar{C}\bar{B}A)}$

$(\overline{AB})(\overline{\overline{AC}}) + \bar{A} + \bar{\bar{C}} + \bar{\bar{B}} + \bar{A}$ – Morgan

$\overline{AB}(\bar{A}C) + \bar{A} + C + B + \bar{A}$ – Doble complemento

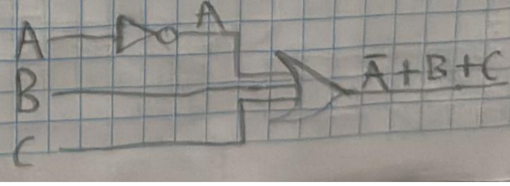
$\overline{AB}(\bar{A}C) + \bar{A} + B + C$ – Idempotencia

$(\bar{A}+\bar{B})(\bar{A}C) + \bar{A} + B + C$ – Morgan

$\bar{A}\bar{A}C + \bar{B}\bar{A}C + \bar{A} + B + C$ – Distributiva

$\bar{A}C + \bar{B}\bar{A}C + \bar{A} + B + C$ – Idempotencia

$\bar{A} + B + C$ – Absorción




c) f(A,B,C) = (AB ( A’ C’ + A‘ B’ C’ ) ‘)’

c) $f(A,B,C) = \overline{[(AB)(\overline{\bar{A}\bar{C}+\bar{A}\bar{B}\bar{C}})]}$

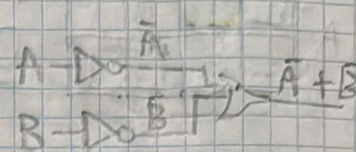
$(\overline{AB}) + (\overline{\overline{\bar{A}\bar{C}+\bar{A}\bar{B}\bar{C}}})$ – Morgan

$(\overline{AB}) + (\bar{A}\bar{C}+\bar{A}\bar{B}\bar{C})$ – Doble complemento

$\bar{A}+\bar{B}+\bar{A}\bar{C}+\bar{A}\bar{B}\bar{C}$ – Morgan

$\bar{A}+\bar{B}+\bar{A}\bar{B}\bar{C}$ – Absorción

$\bar{A}+\bar{B}$ – Absorción



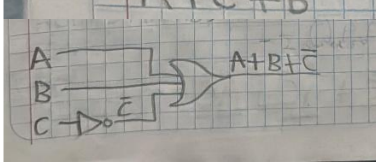

d) f(A,B,C) = (AB + C)’ + (A’CB’)’ + AC( B + BA)

d) $F(A,B,C) = \overline{(AB+C)} + \overline{(A'C\bar{B})} + (AC)(B+BA)$

$(\overline{AB})(\bar{C}) + \bar{\bar{A}} + \bar{C} + \bar{\bar{B}} + ABC + ACBA$ – Morgan y Asociativa

$\overline{AB}\,\bar{C} + A + \bar{C} + B + ABC + ABC$ – Doble complemento y Idempotencia

$A + \bar{C} + B$ – Absorción



e) f(A,B,C,D) = (A’B + A’C ( C’DB + AD’CA’ )’)’

e) $\overline{(\bar A B) + (\bar A C)(\overline{C' D B + A\bar D C \bar A})}$

$\overline{(\bar A B)}\;\overline{(\bar A C)(\overline{\bar C DB + A\bar D C\bar A})}$ — De Morgan

$\overline{(\bar A B)}\,[\overline{(\bar A C)} + \overline{\overline{(\bar C DB + A\bar D C\bar A)}}]$ — De Morgan

$(\bar{\bar A} + \bar B)[\bar{\bar A} + \bar C + \bar C DB + A\bar D C\bar A]$ — Morgan y Doble negación

$(A+\bar B)[A + \bar C + 0\bar D C]$ — Doble negación, absorción y Inverso

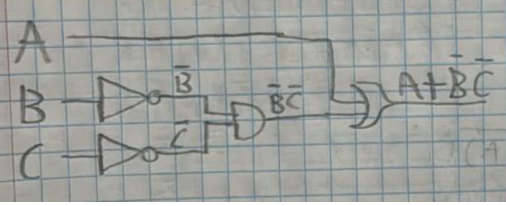
$(A+\bar B)(A+\bar C+0]$ — Acotación

$(A+\bar B)(A+\bar C)$ — Ele neutro

$A(A+\bar C)+\bar B(A+\bar C)$ — Distributiva

$A + A\bar B + \bar B\bar C$ — Absorción y Distributiva

$A+\bar B\bar C$ — Absorción




f) f(A,B,C,D) =((AB’C’ + A’ B’ C’ + (AD)’)’ + ( AD + AB’ D’))’

f) $f(A,B,C,D) = \overline{(\overline{(A\bar B\bar C + \bar A\bar B\bar C + \overline{(AD)})} + (AD + A\bar B\bar D))}$

$= \overline{\overline{(A\bar B\bar C + \bar A\bar B\bar C + \overline{(AD)})}}\;\overline{(AD + A\bar B\bar D)}$ — De Morgan

$= (A\bar B\bar C + \bar A\bar B\bar C + \overline{(AD)})\,\overline{(AD + A\bar B\bar D)}$ — Doble complemento

$= (A\bar B\bar C + \bar A\bar B\bar C + \bar A + \bar D)(\bar A+\bar D)(\bar A + \bar{\bar B} + \bar{\bar D})$ — De Morgan

$= (A\bar B\bar C + \bar A\bar B\bar C + \bar A+\bar D)(\bar A+\bar D)(\bar A+B+D)$ — Doble complemento

$= (\bar B\bar C(A+\bar A) + \bar A+\bar D)(\bar A+\bar D)(\bar A+B+D)$ — Distributiva

$= (\bar B\bar C + \bar A + \bar D)(\bar A+\bar D)(\bar A+B+D)$ — Ele Neutro y Inverso

$= (\bar A+\bar D)(\bar A+B+D)$ — Absorción

$= (\bar A+\bar D)\bar A + (\bar A+\bar D)B + (\bar A+\bar D)D$ — Distributiva

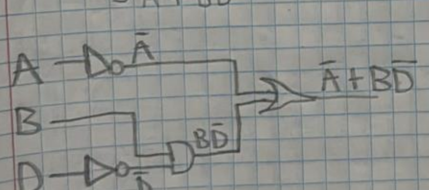
$= \bar A + (\bar A+\bar D)B + (\bar A+\bar D)D$ — Absorción

$= \bar A + B\bar A + B\bar D + \bar A D + \bar D D$ — Distributiva

$= \bar A + B\bar A + B\bar D + \bar A D$ — Inverso y Ele Neutro

$= \bar A + B\bar D + \bar A D$ — Absorción

$= \bar A + B\bar D$ — Absorción



g) f(A,B,C,D) =[((A B)’ + D’ +C ) + ( A’ C’ + (D B)’ + A’ B’ C D )’]’

g) $F(A,B,C,D) = \overline{[((\overline{AB}) + \bar{D} + C) + \overline{(\bar{A}\bar{C}) + (\overline{DB}) + \bar{A}\bar{B}CD}]}$

$\overline{(\bar{A}+\bar{B}+\bar{D}+C)}\,(\bar{A}\bar{C} + \overline{DB} + \bar{A}\bar{B}CD)$ - Morgan

$\bar{\bar{A}}\bar{\bar{B}}\bar{\bar{D}}\bar{C}(\bar{A}\bar{C} + \overline{DB} + \bar{A}\bar{B}CD)$ - Morgan y Doble complemento

$ABD\bar{C}(\bar{A}\bar{C} + \bar{D} + \bar{B} + \bar{A}\bar{B}CD)$ - Doble complemento y Morgan

$ABD\bar{C}(\bar{A}\bar{C} + \bar{D} + \bar{B})$ - Absorción

$\rightarrow \bar{A}\bar{C}ABD\bar{C} + \bar{D}ABD\bar{C} + \bar{B}ABD\bar{C}$ - Distributiva

$0\bar{C}ABD + 0AB\bar{C} + 0AD\bar{C}$ - Inverso y Idempotencia

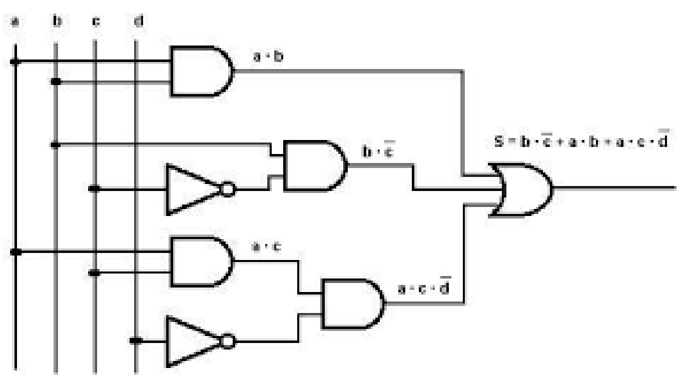
$0 + 0 + 0$ - Acotación

$0$

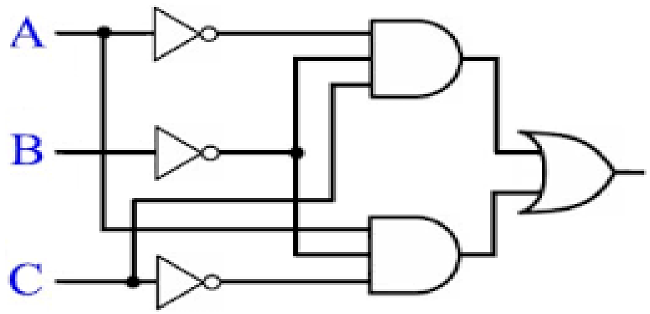
**4.2.** Obtén la función y la tabla de verdad de los siguientes circuitos

**Considera el ejemplo que se muestra a continuación para resolver los dos ejercicios.**

Ejemplo:

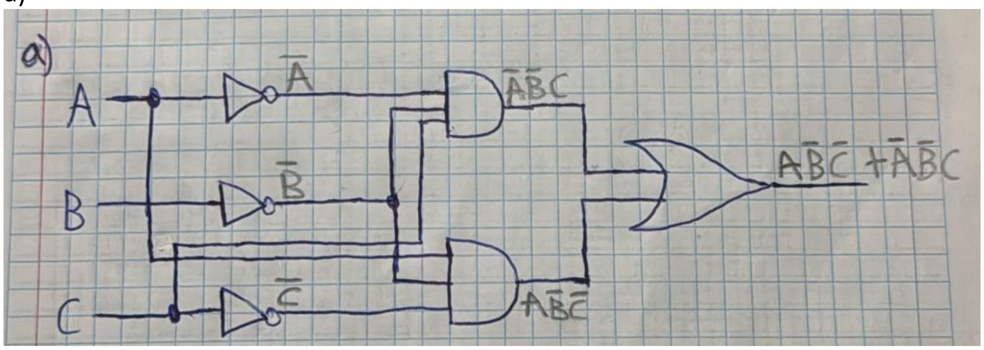



Ejercicios



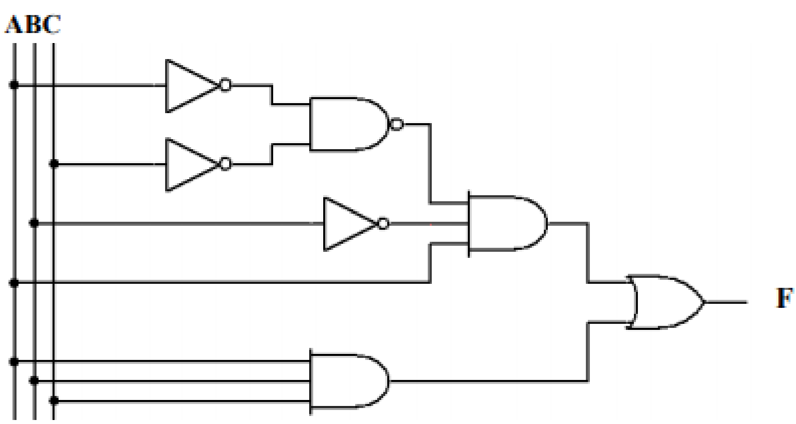
A
B
C


a)

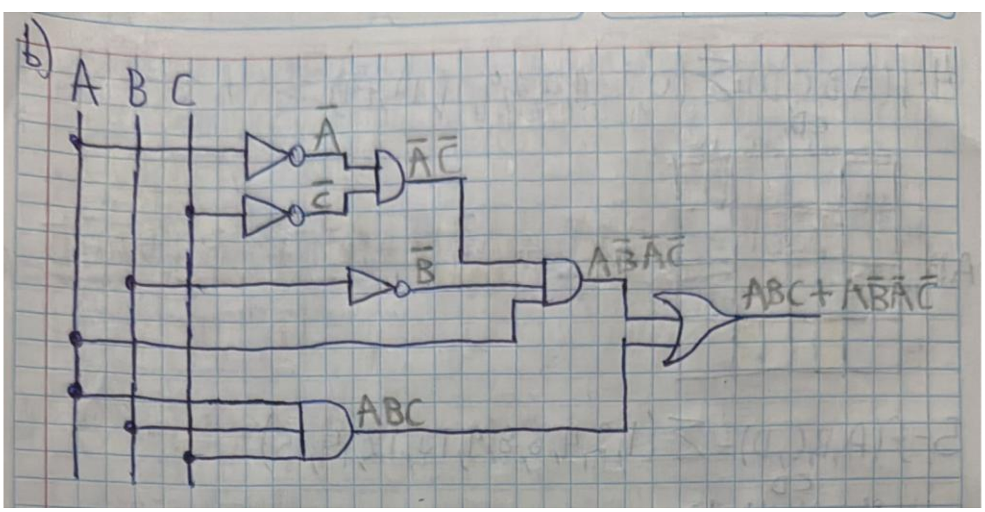


a)
A
B
C
$\bar{A}$
$\bar{B}$
$\bar{C}$
$\bar{A}\bar{B}C$
$A\bar{B}\bar{C}$
$A\bar{B}\bar{C} + \bar{A}\bar{B}C$


b)



ABC
F

b)
A B C
$\bar{A}$
$\bar{C}$
$\bar{A}\bar{C}$
$\bar{B}$
$A\bar{B}\bar{A}\bar{C}$
$ABC + A\bar{B}\bar{A}\bar{C}$
ABC

Considera la siguiente información para ubicar los términos de cada función

| | | x'z' | x'y | xy | xy' |
|---|---|---|---|---|---|
| | | 0 0 | 0 1 | 1 1 | 1 0 |
| w' | 0 | w'x'y' | w'x'y | w'xy | w'xy' |
| w | 1 | w x'y' | wx'y | wxy | wxy' |

Mapa de 3 variables

| | | xz | | | |
|---|---|---|---|---|---|
| | | 0 0 | 0 1 | 1 1 | 1 0 |
| w | 0 | 0 | 1 | 3 | 2 |
| | 1 | 4 | 5 | 7 | 6 |

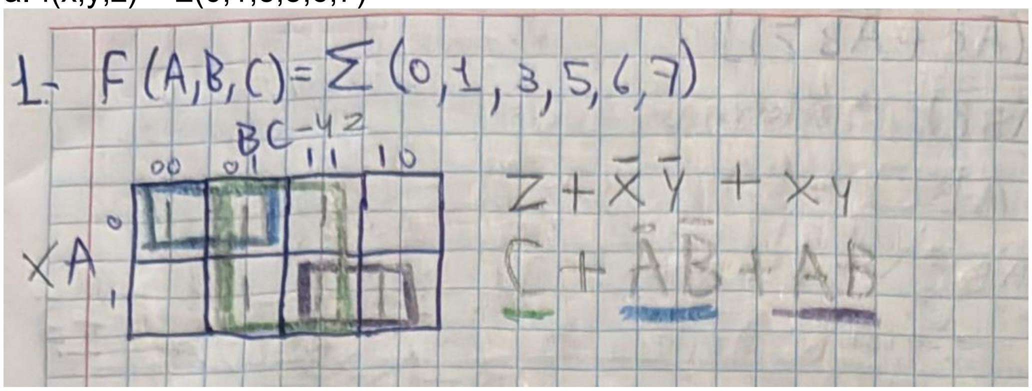
| | | yz | | | |
|---|---|---|---|---|---|
| | | 0 0 | 0 1 | 1 1 | 1 0 |
| wx | 0 0 | w'x'y'z' | w'x'y'z | w'x'y z | w'x'y z' |
| | 0 1 | w'x y'z' | w'x y'z | w'x y z | w'x y z' |
| | 1 1 | w x y'z' | w x y'z | w x y z | w x y z' |
| | 1 0 | w x'y'z' | w x'y'z | w x'y z | w x'y z' |

| | | yz | | | |
|---|---|---|---|---|---|
| | | 0 0 | 0 1 | 1 1 | 1 0 |
| wx | 0 0 | 0 | 1 | 3 | 2 |
| | 0 1 | 4 | 5 | 7 | 6 |
| | 1 1 | 12 | 13 | 14 | 15 |
| | 1 0 | 8 | 9 | 11 | 10 |

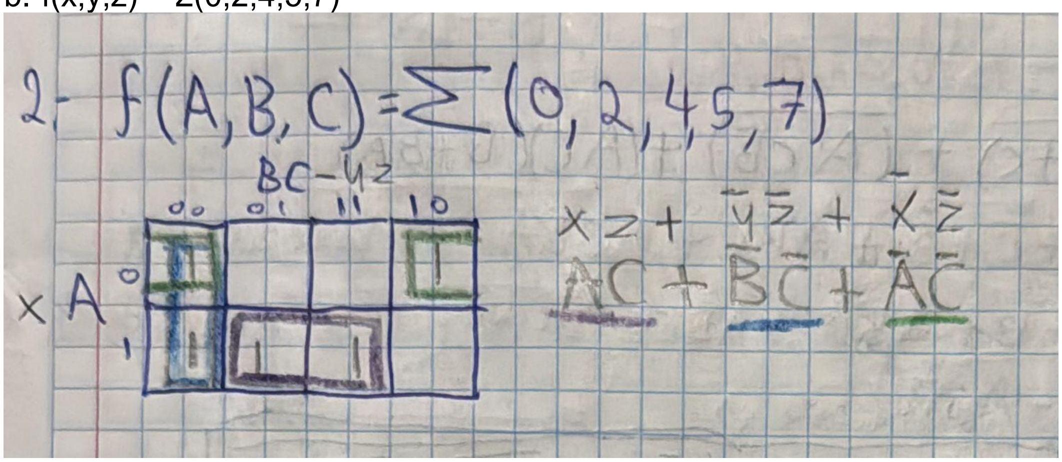
### Ejercicios

4.3 Determina la función inicial y utiliza Mapas de Karnaugh para reducir las siguientes funciones de 3 y 4 variables

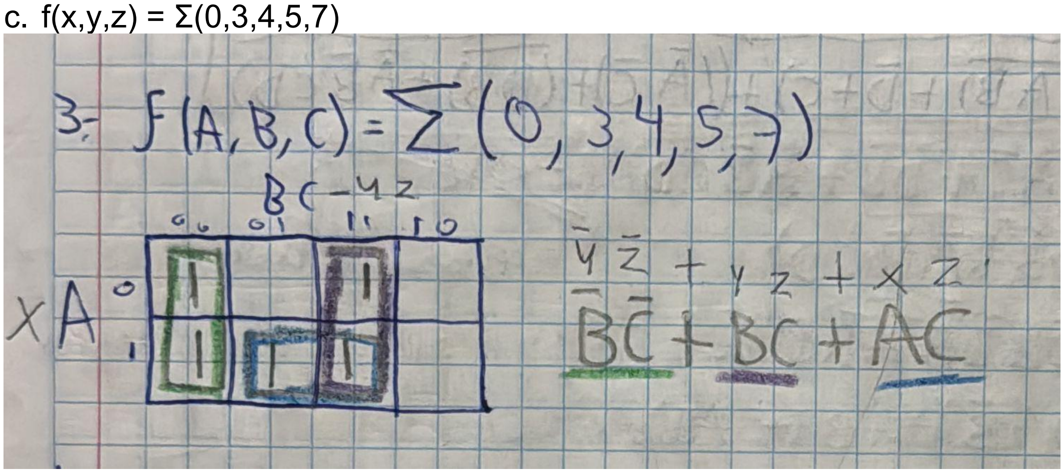
a. f(x,y,z) = Σ(0,1,3,5,6,7)



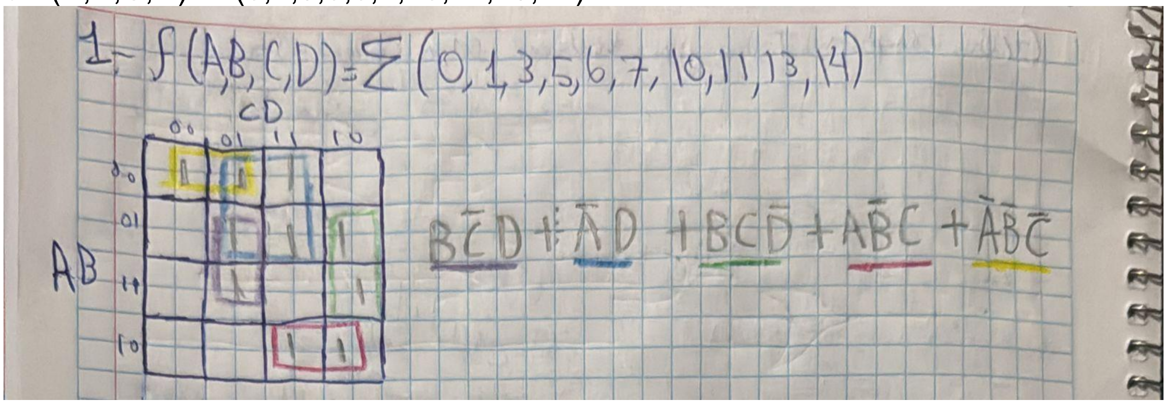

b. f(x,y,z) = Σ(0,2,4,5,7)



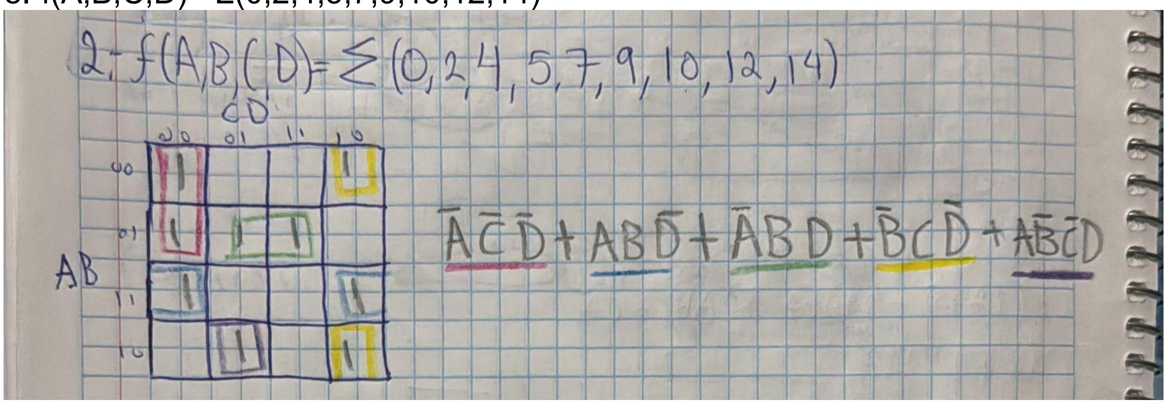

c. f(x,y,z) = Σ(0,3,4,5,7)



d. f(A,B,C,D)= Σ(0,1,3,5,6,7,10,11,13,14)




e. f(A,B,C,D)= Σ(0,2,4,5,7,9,10,12,14)




f. f(A,B,C,D)= Σ(0,3,4,5,7,8,10,12,14,15)