Forms on ch.3
By Rawan Alfares

A communication system for binary-coded decimal (**BCD**) **codes** uses *even parity* for error detection. Assume the sender wants to ***send*** the two numbers; **9** and **7**. Then, the sender ***transmits***:
(**Note**: In this communication system, the parity bit is padded/added for every transmitted BCD digit)

- a. 0 1001 0111
- b. 01001 10111 ✔
- c. 1 1001 0111
- d. 11001 00111
- e. 1001 0111

even parity
9 → 1001 | 01001
7 → 0111 | 10111

The minimum product-of-sums **(POS)** expression for the Boolean function **G(A, B, C, D)** subject to the ***don't care conditions*** given in the following *K-map* is:

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

← kmap → SOP → minterms

$G'(A,B,C,D) = BC' + C'D + A'B$

$G(A,B,C,D) = (B'+C) \cdot (C+D') \cdot (A+B')$

- a. None ✖
- b. G(A, B, C, D) = (B + D) · (A' + C') · (C' + D')
- c. G(A, B, C, D) = (B' + C) · (A + B') · (C + D') ✓
- d. G(A, B, C, D) = (B + D) · (A' + C') · (B + C') · (C' + D')
- e. G(A, B, C, D) = (B' + D') · (A + C) · (B' + C)

Consider the following *K-map* of the Boolean function **F(W, X, Y, Z)**:

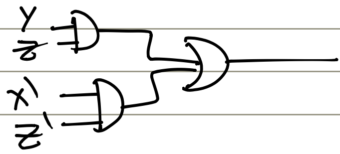
WX \ YZ	00	01	11	10
00	0	1	0	0
01	1	1	0	1
11	1	1	0	1
10	0	1	0	0

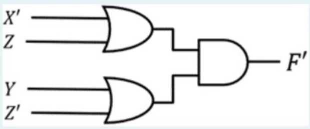
$F = Y'Z + XZ'$

$F' = (Y+Z') \cdot (X'+Z)$

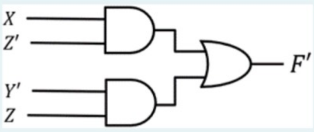
$F' = YZ + X'Z'$

The gate-level implementation for the **simplified *complement*** of **F** expressed as sum-of-products **(SOP)** is:

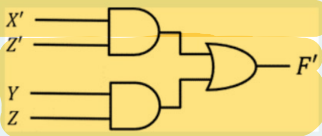


a.


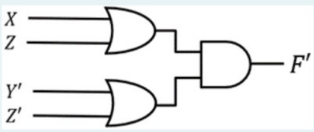
✖

b.


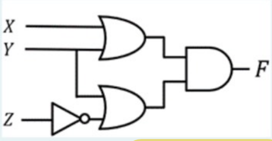
c. None

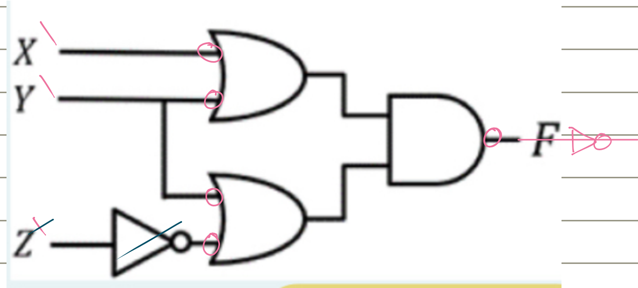
d.


✓

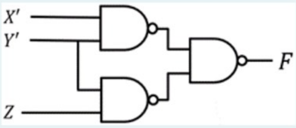
e.


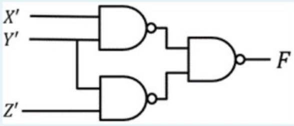
Given the following circuit diagram with *AND/OR/NOT* gates:

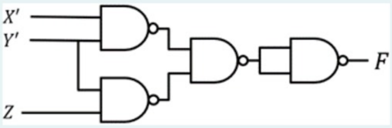


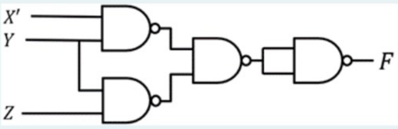


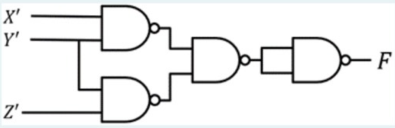
The *equivalent* **NAND** gates only *implementation* of the above circuit is:

a. 

b. 

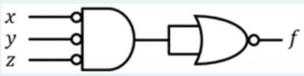
c. 

d. 

e. 

✖

The following circuit is equivalent to:



a. 3-input **NAND** gate
b. 3-input **AND** gate
c. 3-input **NOR** gate
d. 3-input **XNOR** gate
e. 3-input **OR** gate ✔

Given the Boolean function **F(W, X, Y, Z) = ∏(0, 1, 2, 5, 8, 9, 10)**, which of the following is ***not*** a **Prime Implicant** of **F** ?

$= \Sigma(3,4,6,7,11,12,13,14,15)$

a. XZ'
b. None
c. XY ✖
d. YZ
e. WX

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

(xz', wx, yz, xy) PI

Which of the following expressions is **not** *equivalent* to **X'** ?

a. **X** NOR **1** ✔ $(x+1)' = 0' = 1$
b. **X** NOR **X** → $(x+x)' = x'$
c. **X** NAND **1** → $(x \cdot 1)' = x'$
d. **X** NAND **X** → $(x \cdot x)' = x'$
e. **X** XOR **1** → $(x \oplus 1) = x'$

Consider the circuit with the following *truth table*. The circuit has three inputs; **A**, **B**, and **C**.

The output **Z** = ________

A	B	C	Z
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	0

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

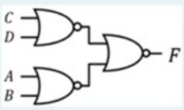
$F = C'$

- a. BC + B'C
- b. B'C' + BC'
- c. C' ✔
- d. None
- e. B'

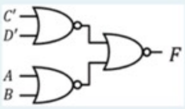
The implementation of Boolean function **F(A, B, C, D) = (A + B) · (C' · D')'** using *NOR* gates only is:

↓ C + D

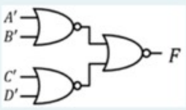
- a. ✔ ✓



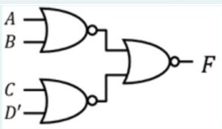
- b.



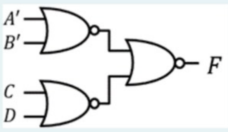
- c.

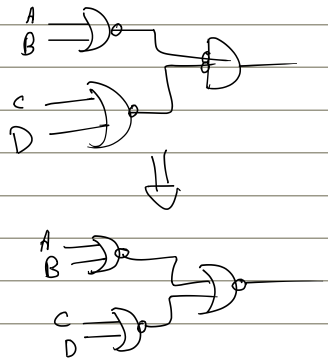


- d.



- e.





Consider the Boolean function **F(W, X, Y, Z) = ∑(0, 1, 2, 4, 6, 10, 12)** which has the don't care conditions **D(W, X, Y, Z) = ∑(7, 13, 14, 15)**, the minimum sum-of-products (**SOP**) expression of **F** is:

- a. F(W, X, Y, Z) = W'X'Y' + W'Z' + YZ'
- b. F(W, X, Y, Z) = W'X'Y' + W'Z' + XZ'
- c. F(W, X, Y, Z) = W'X'Y' + W'Z' + XZ' + YZ' ✖
- d. F(W, X, Y, Z) = W'X'Y' + XZ' + YZ' ✓
- e. F(W, X, Y, Z) = W'X'Y' + WX + XZ' + YZ'

WX \ YZ	00	01	11	10
00	1	1	0	1
01	1	0	X	1
11	1	X	X	X
10	0	0	0	1

$w'x'y' + xz' + yz'$

The Boolean function **F(A, B, C, D) = A ⊕ B ⊕ C ⊕ D = 1** means: → number of ones is odd

- a. Half of the inputs are zeros (for example: A = 0, B = 0, C = 1, D = 1)
- b. One or three of the inputs are ones ✔
- c. All inputs are zeros (A = 0, B = 0, C = 0, D = 0)
- d. One or two or three of the inputs are ones
- e. All inputs are ones (A = 1, B = 1, C = 1, D = 1)

Given the following *K-map* of the Boolean function **F(W, X, Y, Z)**:

WX \ YZ	00	01	11	10
00	1	1	0	1
01	1	X	X	1
11	0	X	X	0
10	1	1	0	0

W'Z'

X'Y'

Which of the following is an ***Essential Prime Implicant*** of **F** ? **(Select all that apply)**

- a. W'Y'
- b. X'Y' ✔
- c. W'Z' ✔
- d. Y'Z
- e. W'X