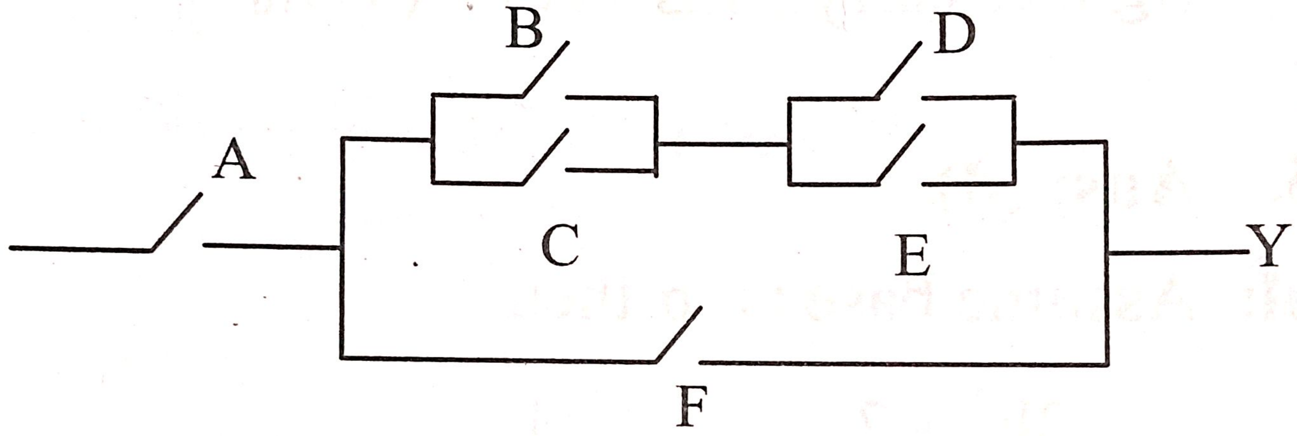
01. What Boolean function does the following circuit represent?



(a) A[F + (B + C)(D + E)]

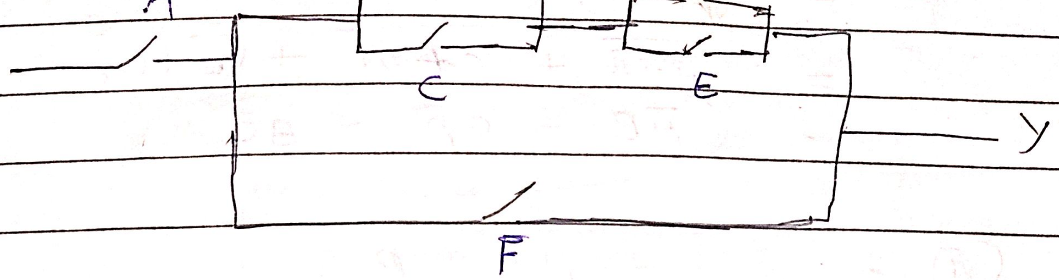
(b) A + BC + DE + F

(c) A(B + C) + A(D + E) + F

(d) None of these

(a) 1 =>

Boolean f^n = ?



Parallel circuit (wires) are equivalent to OR

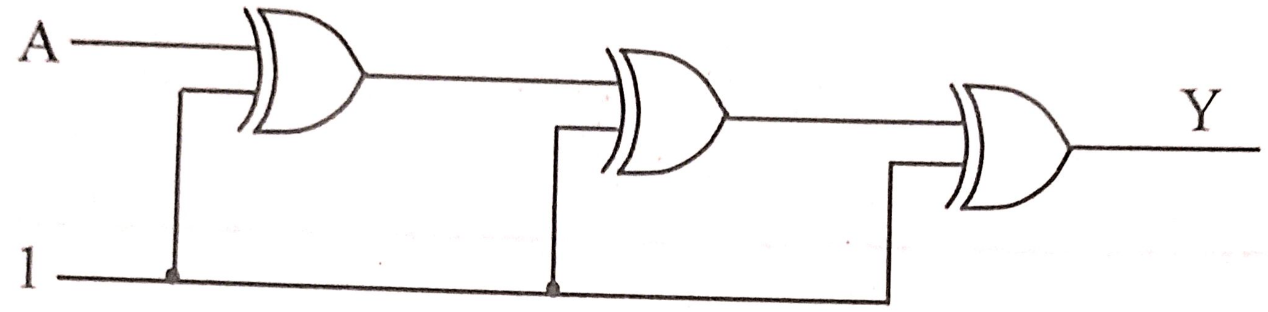
Serial AND

Sol^n -

$$\text{Output} = A((B+C)(D+E)+F)$$

(a) $A[F+(B+C)(D+E)]$

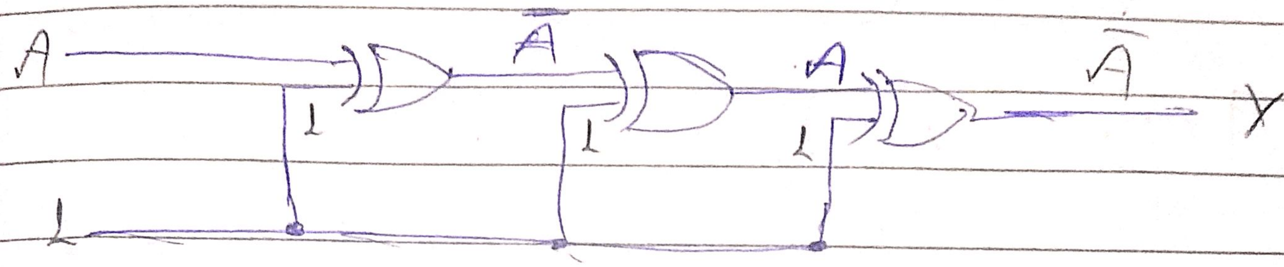
02. The initial output of the following circuit is 1. If we apply 010101 at input A (first bit is zero) then what is the bit pattern generated at the output Y?



(a) 010101 (b) 101010

(c) remains at 0 (d) remains at 1

(b) 2 ⇒



$A \oplus 1 = \bar{A}$, $\bar{A} + 1 = \bar{\bar{A}}$.

$$\boxed{Y = \bar{A}}$$

i/p → 010101

(b) $\boxed{\text{o/p} \rightarrow \bar{A} = 101010}$

03. The complement of the function

$F = (A + \overline{B})(\overline{C} + D)(\overline{B} + C)$ is ________

(a) $\overline{A}B + C\overline{D} + B\overline{C}$

(b) $A\overline{B} + \overline{C}D + \overline{B}C$

(c) $A\overline{B} + C\overline{D} + BC$

(d) $AB + BC + CD$

(q) 3 ⇒ $F = (A+\bar{B})(\bar{C}+D)(\bar{B}+C)$

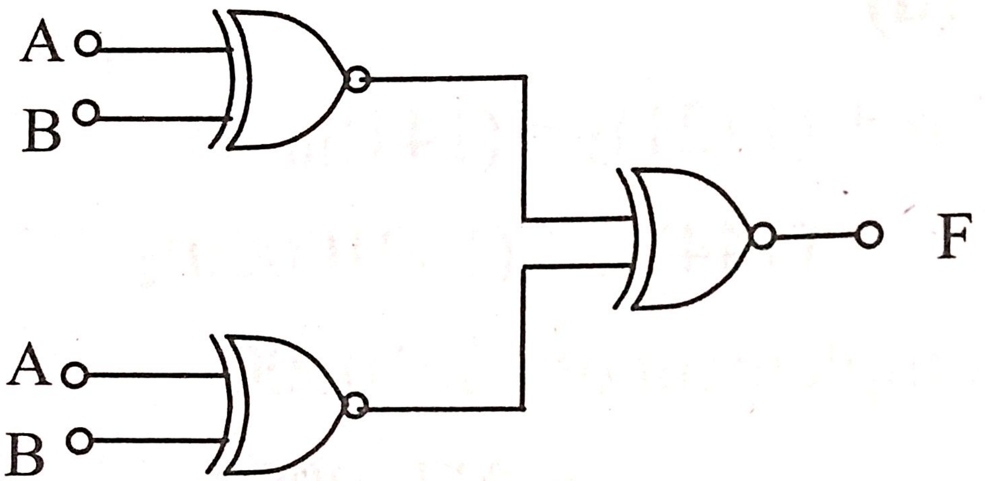
$$\bar{F} = \overline{(A+\bar{B})(\bar{C}+D)(\bar{B}+C)}$$

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

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

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

04. The output of the circuit shown in fig. is equal to



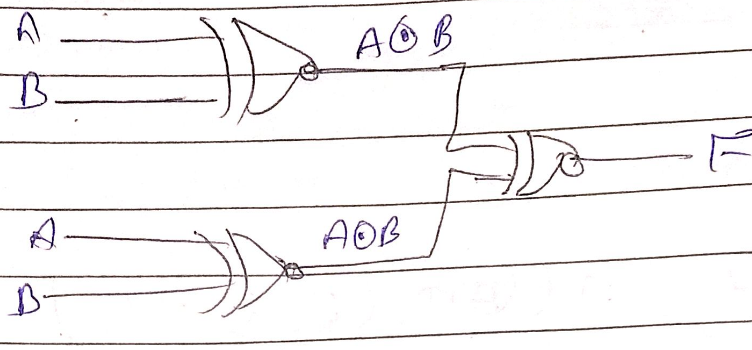
(a) 0

(b) 1

(c) $\overline{A}\,B + A\,\overline{B}$

(d) $\overline{(A * B)} * \overline{(A * B)}$

(b) 4 →



$$F = (A \odot B) \odot (A \odot B)$$

$$= 1$$

$A \oplus A = 0$

$A \odot A = 1$

$\boxed{(b) \quad 1}$

05. If $F(A, B, C) = AB + AC + BC'$ then

$F(\bar{A}, \bar{B}, C).F(\bar{A}, B, \bar{C}).F(A\bar{B}\,\bar{C}) = ?$

(a) $\bar{A}\,\bar{B}\,\bar{C}$

(b) $\bar{A} \oplus \bar{B} \oplus \bar{C}$

(c) $\bar{A} \oplus \bar{B} \odot \bar{C}$

(d) $\bar{A} + \bar{B} + \bar{C}$

(q) 5 ⇒ $F(A, B, C) = AB + AC + BC$

$$F(\bar{A}, \bar{B}, C) \cdot F(\bar{A}, B, \bar{C}) \cdot F(A, \bar{B}, \bar{C}) = (\bar{A}\bar{B} + \bar{A}C + \bar{B}C) \cdot (\bar{A}B + \bar{A}\bar{C} + B\bar{C}) \cdot (A\bar{B} + A\bar{C} + \bar{B}\bar{C})$$

$$= (0 + \bar{A}\bar{B}\bar{C} + 0 + \bar{A}BC + 0 + 0 + 0 + 0 + 0)(A\bar{B} + A\bar{C} + \bar{B}\bar{C})$$

$$= (0 + 0 + \bar{A}\bar{B}\bar{C} + 0 + 0 + 0)$$

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

$\boxed{(a)\ \bar{A}\bar{B}\bar{C}}$

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06. Given $\overline{AB} + \overline{A}B = C$, find $\overline{AC} + \overline{A}C$

(a) $\overline{A} + B$ (b) $A + \overline{B}$

(c) $\overline{A} + \overline{B}$ (d) $A+B$

(a) 6 =>

$$\overline{AB} + \bar{A}B = C$$

$$\overline{AC} + \overline{A}C = ?$$

Solⁿ :-

$$\overline{AB} + \bar{A}B = C$$

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

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

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

$$AB = \bar{C}$$

$$\overline{AC} + \bar{A}C = \bar{A} + \bar{C} + \bar{A}C$$

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

$$= \bar{A} + AB$$

$$= (\bar{A} + A)(\bar{A} + B)$$

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

$$\boxed{(a) \quad \bar{A} + B}$$

07. If $\overline{xy} = 0$ then which one of the following is true ?

(a) $\bar{x}\bar{y}\bar{z} + xyz = xy\bar{z} + \bar{x}\bar{y}\bar{z}$

(b) $\bar{x}y = 1$

(c) $\overline{xy} + \bar{y}x + xz = x\bar{y} + yz$

(d) $\bar{x}y + \bar{y}x = xy + \overline{xy}$

(c) 7.8 $\overline{xy} = 0 \Rightarrow \bar{x} + \bar{y} = 0 \Rightarrow 0+0 = 0$

$\Rightarrow x = y = 1$

(a) $\bar{x}\bar{y}\bar{z} + xyz = xy\bar{z} + \bar{x}\bar{y}\bar{z} \Rightarrow 0 + z = \bar{z} + 0$

(b) $\bar{x}y = 1 \Rightarrow 0 = 1$

(c) $\overline{xy} + \bar{y}x + xz = x\bar{y} + yz \Rightarrow 0 + 0 + 1 = 0 + 1$

(d) $\bar{x}y + \bar{y}x = xy + \overline{xy} \Rightarrow 0 + 0 = 1 + 0$

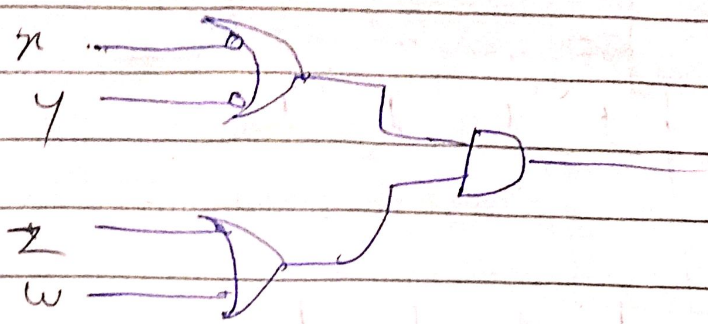
Teacher's Signature ....

08. The minimum number of 2 input NAND gates required to implement the following Boolean function $f = (\overline{x} + \overline{y})(z + w)$

(a) 3
(b) 4
(c) 5
(d) 6

(b) 8 ⇒ Minimum no. 2 i/p NAND = 7

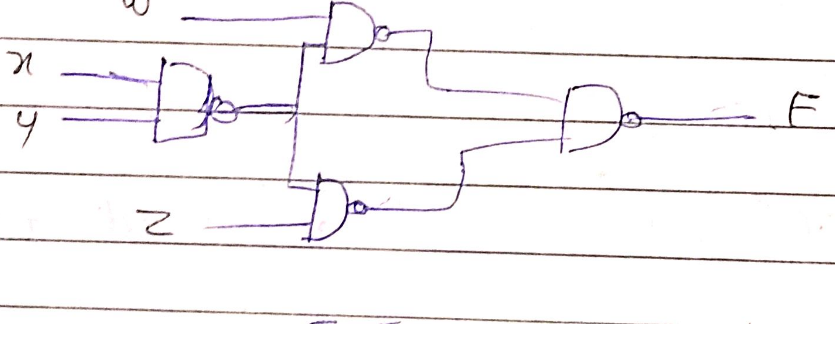
$F = (\bar{x} + \bar{y})(z + w)$



$F = \overline{xy}\,(w + z)$

$F = \overline{xy}\,w + \overline{xy}\,z$

$F = \overline{\overline{\overline{xy}\,w} + \overline{\overline{xy}\,z}}$



8 NAND

09. A circuit which is working as NAND gate with positive level logic system will work as _____ gate with negative level logic system.

(a) NAND (b) NOR

(c) AND (d) OR

(b) 9 ⇒

$\bar{A} + \bar{B}$

A	B	$\overline{AB}$ (+ve logic)	AB (-ve logic)
0	0	1	0
0	1	1	0
1	0	1	0
1	1	0	1

~~NAND~~ ~~NOR~~

(b) NOR

10. The minimum number of two input NOR gates are required to implement the simplified value of the following equation

$f(w, x, y, z) = \sum m(0, 1, 2, 3, 8, 9, 10, 11)$

(a) One

(b) Two

(c) Three

(d) Four

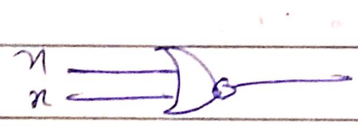
(a) 10: minimum 2 i/p NOR gate = ?

$f(w, x, y, z) = \sum m(0, 1, 2, 3, 8, 9, 10, 11)$

$wx \backslash yz$	$\bar{y}\bar{z}$	$\bar{y}z$	yz	$y\bar{z}$
$\bar{w}\bar{x}$	0 1	1 1	3 1	2 1
$\bar{w}x$	4	5	7	6
wx	12	13	15	14
$w\bar{x}$	8 1	9 1	11 1	10 1

$\Rightarrow \overline{x}$

$F = \overline{x} = \overline{(x+x)}$



(a) 1 NOR

11. **Assertion (A):** XOR gate is not a universal gate.

Reason (R) : It is not possible to realize any Boolean function using only XOR gates.

11) (A) → XOR gate is not a universal gate.

(R) → It is not possible to realize any boolean f^n using only XOR gate.

XOR gate is not a universal gate because of this reason, it is not possible to realize any Boolean f^n using only XOR gates.

12. What is the minimized expression of

$$F = \overline{X}\,\overline{Z} + \overline{Y}\,\overline{Z} + Y\overline{Z} + XYZ\,?$$

(a) $\overline{X}Y + Z$

(b) $XYZ + \overline{Z}$

(c) $\overline{XY} + Z$

(d) $\overline{Z} + XY$

(d) 12 $\Rightarrow$

$$F = \bar{x}\bar{z} + \bar{y}\bar{z} + y\bar{z} + xyz$$

$$= \bar{x}\bar{z} + \bar{z} + xyz$$

$$= \bar{z} + xyz$$

$$= (\bar{z} + xy)(\bar{z} + z)$$

$$= \bar{z} + xy$$

(d)

13. Let $f(A, B) = A + B$, simplified expression for function $f(f(x + y, y), z)$ is

(a) $x + y + z$

(b) xyz

(c) $xy + z$

(d) 1

(a) 13 ⇒ $F(A, B) = A + B$

$f(f(x+y, y), z) = f((x+y+y), z)$

$= x + y + z$

(a)

14. The sum of all the min terms of a given Boolean function is equal to ________.

(a) zero

(b) one

(c) two

(d) complement of the function

(b) 14 => Sum of all minterm -

A \ B	$\bar{B}$	B
$\bar{A}$		
A		

$$S = \bar{A}\bar{B} + \bar{A}B + A\bar{B} + AB$$
$$= \bar{A} + A$$
$$= 1$$

(b)

15. The product of all the max terms of a given Boolean function is always equal to

(a) Two

(b) Complement of the function

(c) One

(d) Zero

(d) 15 ⇒ Product of all max term

$$P = (\bar{A}+\bar{B})(\bar{A}+B)(A+\bar{B})(A+B)$$

$$= (\bar{A}A+\bar{A}B+\bar{B}A+\bar{B}B)(\bar{A}A+\bar{A}\bar{B}+BA+B\bar{B})$$

$$= (\bar{A}B+A\bar{B})(AB+\bar{A}\bar{B})$$

$$= \bar{A}B\cdot AB+\bar{A}B\cdot\bar{A}\bar{B}+A\bar{B}\cdot AB+A\bar{B}\cdot\bar{A}\bar{B}$$

$$= 0+0+0+0$$

$$= 0$$

(d)

16. In a n – variable K–map combining 16 cells containing 1's as a single group will results a term of __________ literals

(a) 4 (b) n – 4

(c) n + 4 (d) 4n

(b) 16 ⇒ n-variable K-map — 16 cells, combines 1's as single group.

Sol^n

If 4-variable K-map ⇒ 16 cells.
16 cell combined ⟶
1's results a term of '0' literal.

If 5-variable K-map ⇒ 32 cells.
16 cell combine ⟶
1's result a term of '1' literal

then n-variable. ⟶ (n-4) literal

(b) n-4

Teacher's Signature

17. What is the other canonical form of the given equation?

$F(x,y,z) = \Sigma\, m\,(0,1,2,3,4,5,6,7)$

(a) $F(x,y,z) = \prod M(0,1,2,3,4,5,6,7)$

(b) $F(x,y,z) = \prod m\,(0,1,2,3,4,5,6,7)$

(c) $F(x,y,z) = \prod M(0,1,2,3,4,5,6,7)$

(d) Does not exist

(d) 1.7(3)

$$F(x, y, z) = \sum m(0, 1, 2, 3, 4, 5, 6, 7)$$

$$F(x, y, z) = \prod M(\ )$$

nothing

(d) Do not exist