

18. The simplified SOP form of the K – map shown below is

		cd	00	01	11	10
		ab	00	01	11	10
00	01	1	1	x	1	
		0	0	0	0	
11	10	0	1	1	0	
		1	x	x	1	

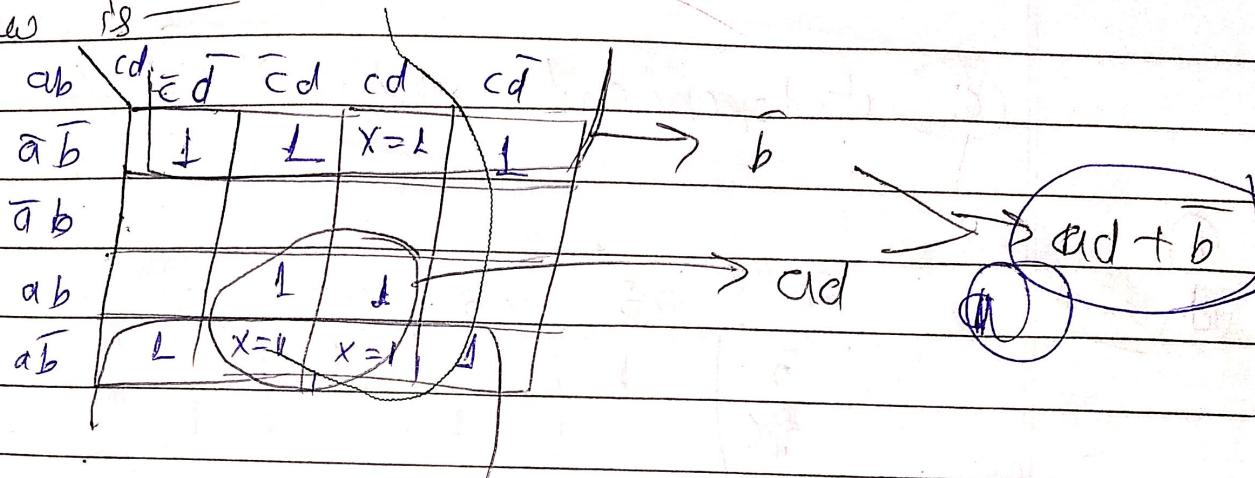
(a) $ad + \bar{b}$

(b) $\bar{a}\bar{b} + ab$

(c) $\bar{a}\bar{b} + ab + ad$

(d) $ab + \bar{a}b + ad$

Q) 18) The simplified SOP form of the K-map shown below is



19. How many essential prime implicants are present in the Karnaugh Map shown in figure

		cd	00	01	11	10
		ab	00			
		00		1	1	1
		01		1	1	
		11			1	
		10			1	

(a) Two

(b) Three

(c) Four

(d) Five

(b) \Rightarrow Essential Prime Implicant \rightarrow

E. Prime Implicant $\rightarrow cd, \overline{ad}, \overline{abc}$

(b) 3 EPF

(3)

20. Maximum number of prime implicants with n binary variables in the reduced expression is _____.

- (a) 2^n
- (c) 2^{n-1}

- (b) 2^{2^n}
- (d) $2^{2^{n-1}}$

Q) Maximum PI , with n-binary variable

$$\textcircled{e} 2^{n-1}$$

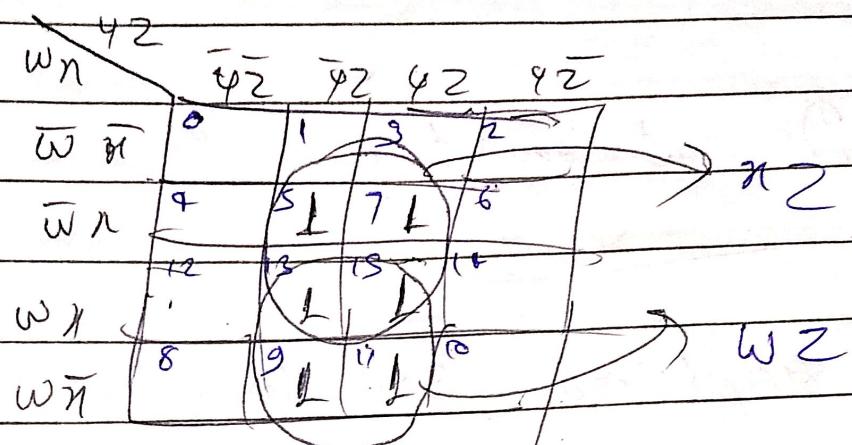
21. The Boolean function

$$f(w, x, y, z) = \sum m(5, 7, 9, 11, 13, 15)$$

is independent of variables

- (a) w
- (b) x
- (c) y
- (d) z and x

(c) ~~21~~ $F(w_1, w_2, w_3, w_4, w_5) = \sum m(5, 7, 9, 11, 13, 15)$



(c) Independent with X

22. The simplified Boolean equation is

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

- (a) $X \oplus Y \oplus Z$ (b) $X \oplus Y \odot Z$
(c) $X \odot Y \odot Z$ (d) $X \odot Y \oplus Z$

b

c) 223

\bar{x}^{42}	\bar{y}^2	\bar{z}^2	y^2	z^2
x	1	1	1	1
z		1		1

$$F = \bar{x}(\bar{y}\bar{z} + yz) + x(\bar{y}^2 + y\bar{z})$$

b)

$$F = x(y \oplus z)$$

c)

$$F = x \odot y \oplus z$$

$$\bar{x}(\bar{y} \oplus z) + x(\bar{y} \oplus z)$$

$$\bar{x}(y \odot z) + x(\bar{y} \odot z)$$

Common Data for Questions 23 & 24

The function

$$f(A, B, C, D) = \sum m(0, 1, 4, 6, 7, 8, 10, 14, 15).$$

23. The number of prime implicants and

essential prime implicants are

- (a) 6, 1 (b) 6, 2
(c) 7, 1 (d) 7, 2

24. Prime implicant set is

- (a) $\{\overline{BC}, \overline{A}\overline{C}\overline{D}, \overline{A}\overline{B}\overline{C}, \overline{AB}\overline{D}, A\overline{CD}, A\overline{C}D\}$

(b) $\{\overline{BC}, \overline{ABC}, \overline{ABD}, \overline{ABD}, A\overline{CD}, \overline{BC}\overline{D}\}$

(c) $\{\overline{BC}, A\overline{CD}, \overline{AB}\overline{D}, \overline{AC}\overline{D}, \overline{ABC}, \overline{ABD}, \overline{BCD}\}$

(d) $\{\overline{BC}, \overline{AC}\overline{D}, \overline{AB}\overline{D}, A\overline{CD}, \overline{ABC}, \overline{ABD}, \overline{BCD}\}$

Common for 23 & 29

Q3) $F(A, B, C, D) = \Sigma m(0, 1, 4, 5, 7, 8, 10, 11, 15)$

Q3) No. of PI & EPI

AB	$\bar{C}\bar{D}$	$\bar{C}D$	CD	$C\bar{D}$
$\bar{A}\bar{B}$	1	1	3	2
$\bar{A}B$	1	1	1	1
AB	2	3	1	1
$A\bar{B}$	5	9	4	6

EPZ

PI $\rightarrow \bar{A}\bar{B}\bar{C}, \bar{C}\bar{D}\bar{B}, \bar{A}B\bar{D}, A\bar{B}\bar{D}, AC\bar{D}, BC, \bar{A}\bar{C}\bar{D}$

Q) 7 - PI
2 - EPI

Q4) PI - Set -

C) \$BC, AC\bar{D}, A\bar{B}\bar{D}\bar{C}, \bar{A}\bar{C}\bar{D}, \bar{A}\bar{B}\bar{C}, \bar{A}\bar{D}\bar{D}, \bar{B}\bar{C}\bar{D}\$?

25. To implement the simplified value of the following Boolean function, minimum of how many AND, NOT and OR gates are required?

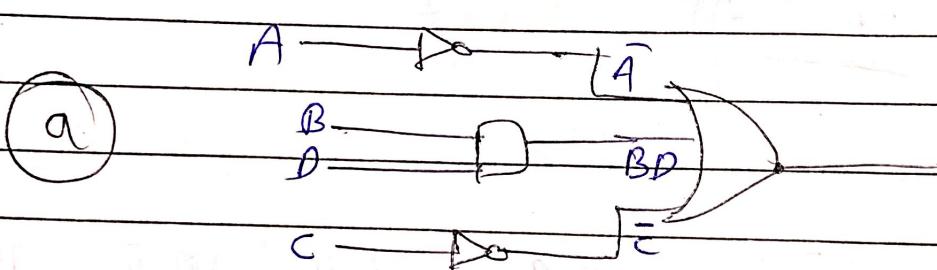
$$f(A,B,C,D) = \overline{A} + A\overline{C} + \overline{A}\overline{B}C + AB\overline{C}D + ABCD$$

- (a) One 3-input OR gate , One 2-input AND and two NOT gates
- (b) One 3-input OR gate, Two 2-input AND and two NOT gates
- (c) Two 3-input OR gate, One 2-input AND and one NOT gates
- (d) One 3-input OR gate, One 2-input AND and one NOT gates

a) 25

How many AND, NOT, OR gate -

$$\begin{aligned} F(A, B, C, D) &= \bar{A} + A\bar{C} + \bar{A}\bar{B}\bar{C} + AB\bar{C}D + ABCD \\ &= \bar{A} + A\bar{C} + \underbrace{\bar{A}\bar{B}\bar{C}}_{\text{AND}} + \underbrace{AB\bar{C}D}_{\text{OR}} + ABCD \\ &= \bar{A}(1 + \bar{B}C) + A\bar{C}(1 + B\bar{D}) + ABCD \\ &= \bar{A} + A\bar{C} + ABCD \\ &= \bar{A} + \bar{C} + ABCD \\ &= \bar{A} + (\bar{C} + ABCD)(\bar{C} + C) \\ &= \bar{A} + BD + \bar{C} \end{aligned}$$



26. In K-map simplification, combining eight adjacent ones as a group leads a term with -
- (a) One literal less than the total number of variables
 - (b) Two literals less than the total number of variables
 - (c) Three literals less than the total number of variables
 - (d) Four literals less than the total number of variables

c) 26) In K-map - combine 8- adjacent one's

c) Three literals less than the total number of variables.

27. The logic expression

$Y = \Sigma m (0, 3, 6, 7, 10, 12, 15)$ is equivalent to

- (a) $Y = \pi M (0, 3, 6, 7, 10, 12, 15)$
- (b) $Y = \pi M (1, 2, 4, 5, 8, 9, 11, 13, 14)$
- (c) $Y = \Sigma m (1, 2, 4, 5, 8, 9, 11, 13, 14)$
- (d) $Y = \Sigma m (3, 0, 10, 12)$

b) 27 = $y = \text{Sum}(0, 3, 6, 7, 10, 12, 15)$

b) $y = \text{Product}(1, 2, 3, 5, 8, 9, 11, 13, 14)$

28. Pick up *correct* statements from the following:

1. In an n-variable k-map combining 16 adjacent cells containing 1's as a single group will generate a prime implicant which is independent of four variables.
2. D-latch cannot be implemented with multiplexer circuit.

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Connect statement -

(C)

5th

9th

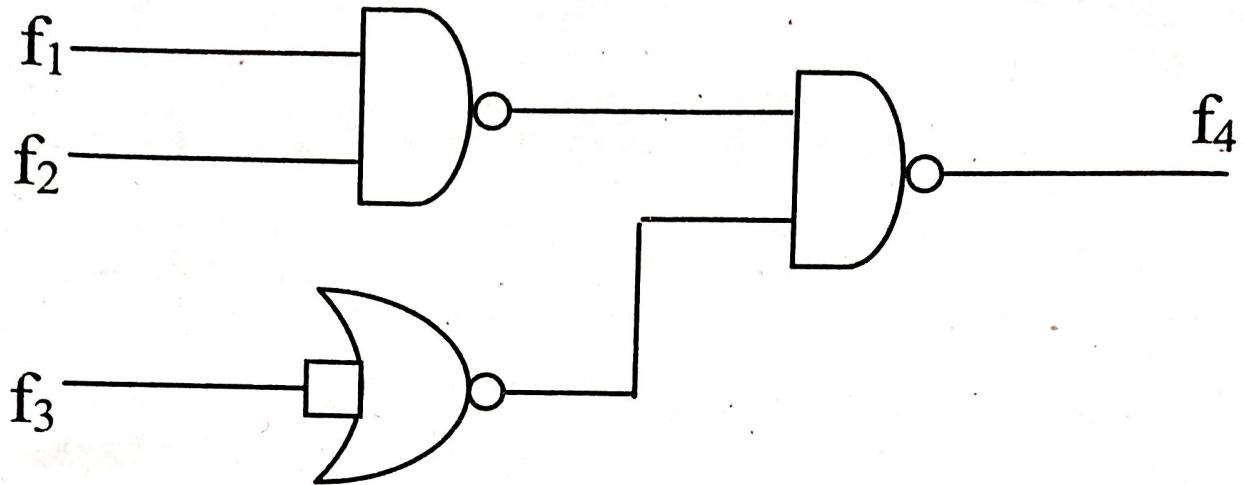
vs 5th

29. How many Boolean functions of the type $f(x, y, z) = f(\bar{x}, \bar{y}, \bar{z})$ are available with three variables ?

- (a) 4
 - (b) 8
 - (c) 32
 - (d) 16

- (d) $f(x, y, z) = f(\bar{x}, \bar{y}, \bar{z})$
How many boolean $f^n = ?$
- (d) Total number of boolean expression = 16

30. Consider the logic circuit shown in figure.



The functions f_1 , f_2 and f_4 are

$$f_1(w, x, y, z) = \sum m(8, 9, 10)$$

$$f_2(w, x, y, z) = \sum m(7, 8, 12, 13, 14, 15)$$

$$f_4(w, x, y, z) = \sum m(8, 9)$$

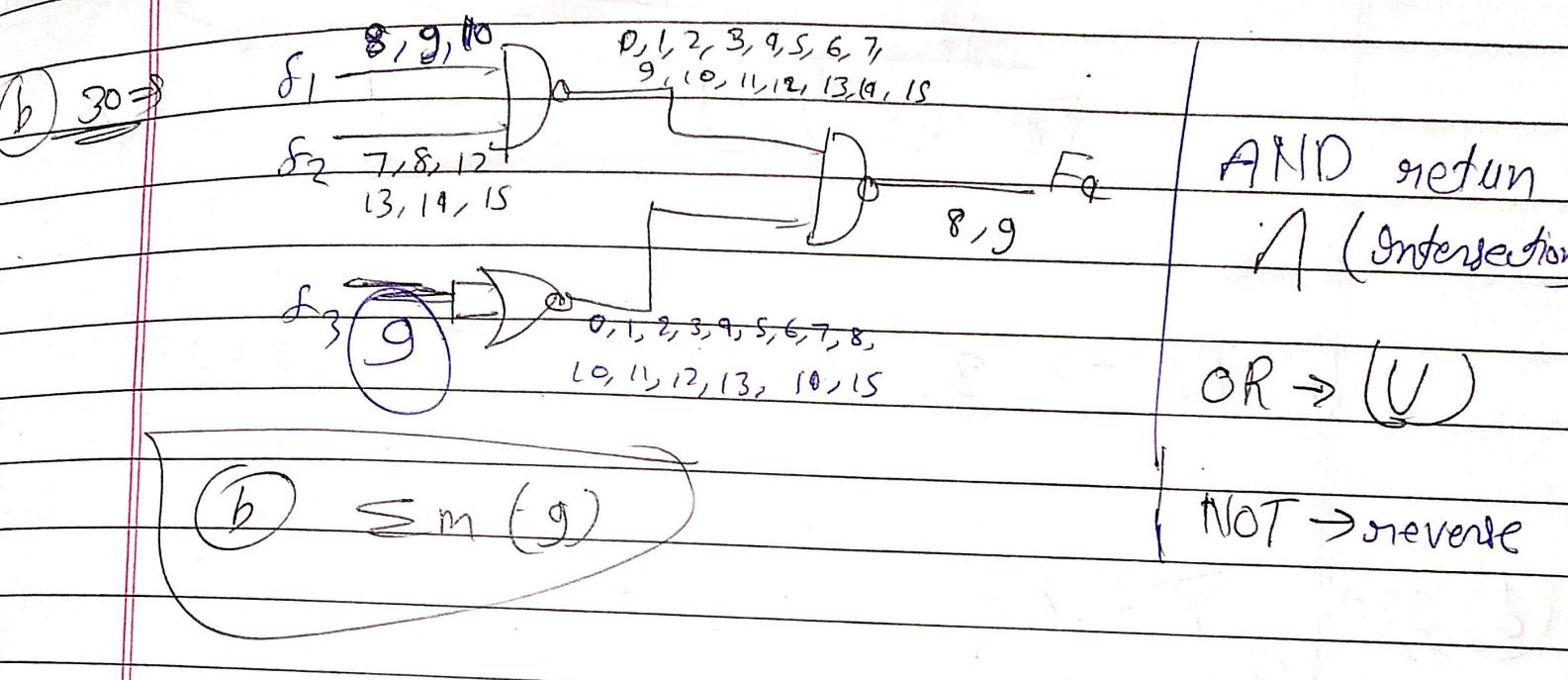
Then $f_3(w, x, y, z)$ is

(a) $\sum m(9, 10)$

(b) $\sum m(9)$

(c) $\sum m(1, 8, 9)$

(d) $\sum m(8, 10, 15)$



31. How many minimum number of NAND gates are required to implement the following Boolean equation, by taking inputs as A, B, C, D, E, F

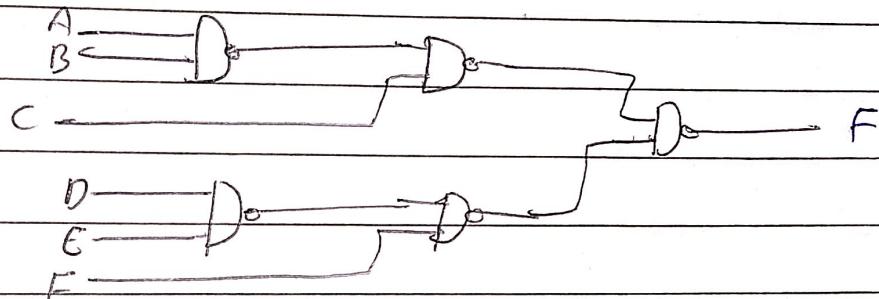
$$F = \overline{A}C + \overline{D}F + \overline{B}C + \overline{E}F$$

- (a) 4
- (b) 5
- (c) 6
- (d) 7

(b) \Rightarrow

minimum NAND gates?

$$\begin{aligned} F &= C(\bar{A} + \bar{B}) + F(\bar{D} + \bar{E}) \\ &= \cancel{C}(\bar{A}\bar{B}) + F(\bar{D}\bar{E}) = \overline{C(\bar{A}\bar{B})} \cdot \overline{F(\bar{D}\bar{E})} \end{aligned}$$



(b) 5 NAND

Teacher's Signature

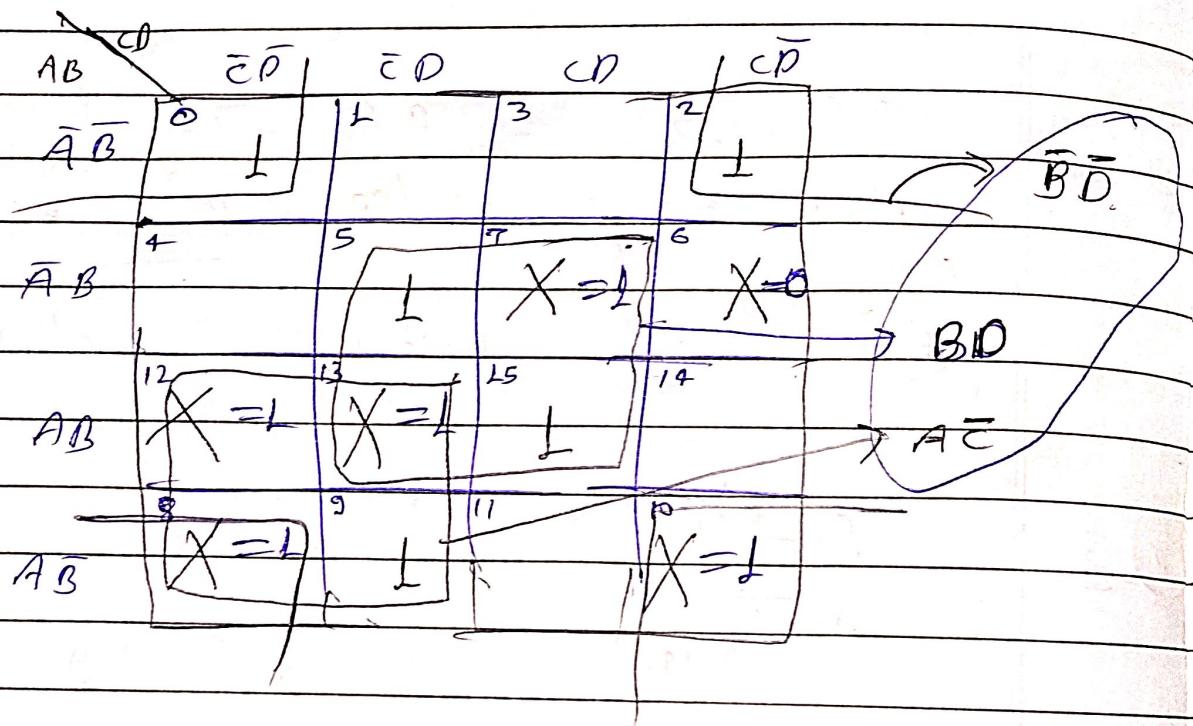
32. Find the number of prime implicants,
Essential prime implicants, and minimized
expression is

$$F(A, B, C, D) = \sum m(0, 2, 5, 9, 15) + \sum d(6, 7, 8, 10, 12, 13)$$

- (a) 3, 3, $\overline{BD} \overline{D} + A \overline{C} + BD$
- (b) 4, 3, $\overline{BD} \overline{D} + A \overline{C} + BD$
- (c) 4, 4, $B \overline{D} + A \overline{C} + \overline{B} D$
- (d) 3, 4, $B \overline{D} + A \overline{C} + \overline{B} D$

(a) 32 = PI, EPZ = ?

$$F(A, B, C, D) = \sum m(0, 2, 5, 9, 18) + \sum d(6, 7, 8, 10, 12, 13)$$



(a) PI \rightarrow 3, ESP \rightarrow 3, $\bar{B}\bar{D} + B\bar{D} + A\bar{C}$

33. What is the value of $A + \overline{A}B$?
- (a) A
 - (b) B
 - (c) 0
 - (d) $A+B$

~~(d) 33)~~

$A + \bar{A}B$

~~(d) $A+B$~~