QUESTION BANK

1. The Boolean equation Y = ABC + ABC + ABC can be simplified to

(a) AB (b) AC

(c) A (B + C) (d) ABC

2. The Boolean equation Y = (A + B) (A + B) can be simplified to

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

(c) A + B (d) AB

3. The K-map for a Boolean function is shown in figure. The number of essential prime implicants of this function is

CD \ AB	00	01	11	10
00	1	1	0	1
01	0	0	0	1
11	1	0	0	0
10	1	0	0	1

(a) 4 (b) 5

(c) 6 (d) 8

4. The function shown in the figure when simplified will yield a result with

CD \ AB	00	01	11	10
00	1	0	1	1
01	0	1	0	0
11	1	0	1	0
10	0	1	0	1

(a) 2 terms (b) 4 terms

(c) 7 terms (d) 16 terms

5. The minimized form of the logical expression $\bar{A}\bar{B}\bar{C}+\bar{A}B\bar{C}+\bar{A}BC+AB\bar{C}$ is

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

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

6. A bulb is controlled by two switches A and B. The bulb glows only when either switch A or switch B is ON. Its Boolean expression is

(a) $A\bar{B}+\bar{A}B$ (b) $\bar{A}\bar{B}+AB$

(c) AB (d) A + B

7. Given Boolean theorem

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

Which one of following identifies is true

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

(b) $AB+\bar{A}C+BC=AB+BC$

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

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

8. What is dual of $X+\bar{X}Y=X+Y$

(a) $X+Y=XY$

(b) $\bar{X}+XY=XY$

(c) $X(\bar{X}+Y)=XY$

(d) $X(\overline{XY}Z+XYZ+\bar{X}YZ)$

9. What is dual of A + [B (A + C)] + D

(a) A + [(B(A + C)] + C

(b) A [B + AC] D

(c) A + [B(A + C)] D

(d) A [B (A + C)] D

10. With 4 Boolean variables, how many Boolean expressions can be formed?

(a) 16 (b) 256

(c) 1024 (1K) (d) 64 K (64 × 1024)

11. The number of Boolean functions that can be generated by n variables, is equal to

(a) 2^n (b) 2^{2^n}

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

12. For the product-of sums expression L = (X + Y) $(\overline{X}+\overline{Z})$, the equivalent sum-of-products expression will be

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

(c) $\overline{X}Y+X\overline{Z}$ (d) $X\overline{Y}+\overline{X}Z$

13. What is the minimum of NAND gates required to implement $A+A\overline{B}+A\overline{B}C$?

(a) 0 (b) 1

(c) 4 (d) 7

14. Match List-I (Boolean function) with List-II (Minimum number of two-input NAND gates) and select the correct answer using the codes given below the Lists

	List-I	List-II
A.	$Y=A\overline{B}C+\overline{A}BC$	1. Five
B.	$Y=\overline{A}\overline{B}+AB+\overline{C}$	2. Four
C.	$Y=A\overline{B}+\overline{A}B+A\overline{B}C$	3. Six

Codes :

	A	B	C
(a)	3	1	2
(b)	1	3	2
(c)	2	1	3
(d)	1	2	3

15. A, B and C are three Boolean variables. Which one of the following Boolean expressions cannot be minimized any further?

(a) $Z=A\overline{B}\overline{C}+AB\overline{C}+ABC+\overline{A}\overline{B}\overline{C}$

(b) $Z=A\overline{B}C+AB\overline{C}+ABC+\overline{A}\overline{B}\overline{C}$

(c) $Z=A\overline{B}\overline{C}+\overline{A}\overline{B}C+ABC+\overline{A}B\overline{C}$

(d) $Z=\overline{A}B\overline{C}+AB\overline{C}+ABC+\overline{A}\overline{B}C$

16. Karnaugh map is used to

(a) minimize the number of flip-flop in a digital circuit.

(b) minimize the number of gates in a digital circuit.

(c) minimize the number of gates and fan-in of a digital circuit.

(d) design gates

17. While obtaining minimal sum of products expression

(a) all don't cares are ignored

(b) all don't cares are treated as logic ones

(c) all don't cares are treated as logic zeros

(d) only such don't cares that aid minimization are treated as logic ones

18. The product-of sum expression for given truth table is

X	Y	Z
0	0	1
0	1	0
1	0	1
1	1	0

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

(b) $Z=(X+\overline{Y})(\overline{X}+\overline{Y})$

(c) $Z=(\overline{X}+Y)(\overline{X}+\overline{Y})$

(d) None of the above

19. The Boolean expression AC + $B\overline{C}$ is equivalent to

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

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

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

(d) $ABC+\overline{A}B\overline{C}+A\overline{B}C+AB\overline{C}$

20. The Boolean expression Y (A, B, C) = A + BC, is to be realized using 2-input gates of only one type. What is the minimum number of gates required for the realization ?

(a) 1 (b) 2

(c) 3 (d) 4 or more

21. If X, Y and Z are Boolean variables, then the expression $X(X+\overline{X}Y)$ Z(X + Y + Z) is equal to

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

(c) XYZ (d) XZ

22. If X and Y are Boolean variables, which one of the following is the equivalent of $X \oplus Y \oplus XY$?

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

(c) 0 (d) 1

23. In boolean algebra if F = (A + B) ($\overline{A}$ + C). Then

(a) $F = AB + \overline{A}C$ (b) $F = AB + \overline{AB}$

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

24. The logical expression $y = A + \overline{A}B$ is equivalent to

(a) y = AB (b) $y = \overline{A}B$

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

25. The Boolean function A + BC is a reduced form of

(a) AB + BC (b) (A + B)(A + C)

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

26. Boolean expression for the output of XNOR (Equivalent) logic gate with inputs A and B is

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

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

27. The simplified form of the Boolean expression $Y = (\overline{A}BC + D)(\overline{A}D + \overline{B}\overline{C})$ can be written as

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

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

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

(d) $A\overline{D} + BC\overline{D}$

28. The logic Y = AB + $\overline{A} + \overline{B}$ is equivalent to

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

(c) Y = 1 (d) Y = 0

29. The logic function f = $\overline{(x\overline{y}) + (\overline{x}y)}$ is the same as

(a) $f = (x + y)\ (\overline{x} + \overline{y})$

(b) $f = \overline{(\overline{x} + \overline{y}) + (x + y)}$

(c) $f = (\overline{xy})(xy)$

(d) None of the above

30. According to boolean algebra, $(A + \overline{B} + \overline{A}B)$ equal to

(a) 1 (b) 0

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

31. The boolean expression for NAND gate is

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

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

32. The simplified form of Boolean function $(\overline{A} + B)(A + \overline{C})(\overline{B} + \overline{C})$ is

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

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

33. The complement of boolean expression

$F = (X + \overline{Y} + Z)\ (\overline{X} + \overline{Z})\ (X + Y)$ is

(a) $XYZ + X\overline{Z} + \overline{Y}Z$ (b) $\overline{X}Y\overline{Z} + XZ + \overline{X}\,\overline{Y}$

(c) $\overline{X}Y\overline{Z} + XZ + \overline{Y}\,\overline{Z}$ (d) $XYZ + \overline{X}\,\overline{Y}$

34. In the logic equation

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

$(A + \overline{B}C + A\overline{C}) = 1$ if $C = \overline{A}$ then

(a) A + B = 1 (b) $\overline{A} + B = 1$

(c) $A + \overline{B} = 1$ (d) A = 1

35. A Boolean function can be expressed

(a) as sum of maxterms or product of minterms

(b) as product of maxterms or sum of minterms

(c) parity as product of maxterms and partly as sum minterms

(d) partly as sum of maxterms and partly os minterms

36. Which one of the following Boolean expressions is correct

(a) $\overline{x + y} = \overline{x}\,\overline{y}$ (b) $\overline{\overline{x} + y} = \overline{x}\,\overline{y}$

(c) $\overline{\overline{x} + \overline{y}} = \overline{x}\,\overline{y}$ (d) $\overline{\overline{x} + \overline{y}} = \overline{x} + \overline{y}$

37. The minimized form of the Boolean expression F(A, B, C) = Π (0, 2, 3) is

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

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

38. For the identity $AB + \overline{A}C + BC = AB + \overline{A}C$, the dual form is

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

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

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

(d) $\overline{A}\,\overline{B} + A\overline{C} + \overline{B}\overline{C} = \overline{A}\overline{B} + A\overline{C}$

39. The minimized expression for the K-map shown in the above figure is

CD \ AB	00	01	11	10
00	1	0	0	1
01	1	1	1	1
11	0	0	0	0
10	1	0	0	1

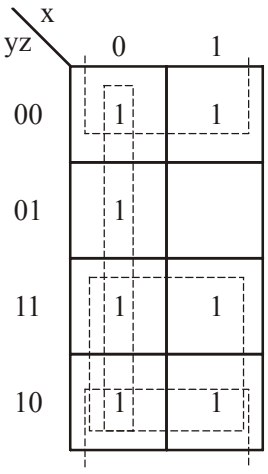
(a) $\overline{A}\overline{B}\overline{C}D + ABC\overline{D} + \overline{A}\overline{B}\overline{C} + A\overline{B}\overline{C} + B\overline{C}D$

(b) CD + ABC + ABC + ABCD + ABCD

(c) BCD + BCD + CD

(d) $\overline{B}\,\overline{D} + \overline{C}\,D$

40. For the Karnaugh map shown in the given figure, the minimum boolean function is



(a) $\overline{x}\,\overline{y} + \overline{z} + yz$ (b) $x\overline{z} + z + z\overline{y}$

(c) $xy + z + \overline{y}z$ (d) $x + y + \overline{z}$

41. The term AB + AC + $\overline{C}$B reduce to

(a) AB + CA (b) AC + BC

(c) AC + $\overline{C}$B (d) AB + $\overline{B}\overline{C}$

42. The reduced form of the Boolean expression $A\left[B + C\overline{(AB + AC)}\right]$ is

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

(c) AB (d) $AB + B\overline{C}$

43. The Karnaugh map for a four variable boolean function is given in figure. The correct boolean sum of product is

RS \ PQ	00	01	11	10
00	0	0	0	0
01	1	0	0	1
11	1	0	0	1
10	0	1	0	0

(a) $PQRS + \overline{Q}S$ (b) $\overline{P}QR\overline{S} + \overline{Q}S$

(c) $PQR + Q\overline{S}$ (d) $PQRS + \overline{Q}$

44. The minimal sum of products form of f = $A\overline{B}CD + \overline{A}BC + BCD$ is

(a) $\overline{A}C + BD$ (b) $ACD + \overline{A}BC$

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

45. A combinational circuit has input A, B and C and its Karnaugh map is given in figure. The output of the circuit is

C \ AB	00	01	11	10
0		1		1
1	1		1	

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

(c) A ⊕ B ⊕ C (d) $\overline{A}\overline{B}\overline{C}$

46. Which one of the following is the dual-form of the Boolean identity $AB + \bar{A}C = (A + C)(\bar{A} + B)$

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

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

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

(d) $AB + \bar{A}C = AB + \bar{A}C + BC$

47. The number of switching function of 3 variables is

(a) 8 (b) 64

(c) 128 (d) 256

48. Karnaugh map is used to

(a) minimize the number of flip-flop in a digital circuit.

(b) minimize the number of gates in a digital circuit.

(c) minimize the number of gates and fan-in of a digital circuit.

(d) design gates.

49. Y = f (A, B) = ΠM (0, 1, 2, 3) represents (M is Maxterm)

(a) NOR gate

(b) NAND gate

(c) OR gate

(d) a situation where output is independent of input

50. How many minterms (excluding redundant terms) does the minimal switching function f(v, w, x, y, z) = x + $\bar{y}z$ originally have?

(a) 16 (b) 20

(c) 24 (d) 32

❑❑❑

ANSWERS WITH EXPLANATIONS

1. ***Ans. (d)***

$$Y = ABC + ABC + ABC$$
$$= ABC\ (1 + 1 + 1)$$
$$= ABC\ (1)$$
$$= ABC$$

2. ***Ans. (c)***

$$Y = (A + B)\ (A + B)$$
$$= AA + AB + BA + BB$$
$$= A + AB + B$$
$$= A\ [1 + B] + B$$
$$= A + B$$

3. ***Ans. (a)***

4. ***Ans. (c)***

5. ***Ans. (a)***

6. ***Ans. (a)***

The bulb is controlled by two switches A and B such that the bulb glows only when either switch A or switch B is ON then truth table will be

A	B	Output
0	0	0
0	1	1
1	0	1
1	1	0

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

7. ***Ans. (a)***

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

To find out the any Boolean expression we just replace AND operation by OR and OR operation by AND operation

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

8. ***Ans. (c)***

$$X + \bar{X}Y = X + Y$$

Its dual will be

$$X[\bar{X} + Y] = XY$$

9. ***Ans. (b)***

$$F = A + [B(A + C)] + D$$

then its dual will be

$$F_D = A\ [B + AC]D$$

10. ***Ans. (d)***

With n Boolean variables, we can form $\left(2^{2^n}\right)$ different Boolean expression.

For $n = 4$

We can form

$$2^{2^4} = 2^{16} = 2^6 \times 2^{10}$$

Since $2^{10} = 1$ K or 1024

$\therefore$ $2^6 \times 2^{10} = 64$ K

or (64×1024) Boolean expressions.

11. ***Ans. (b)***

By n variables we can generate 2^{2^n} Boolean functions.

12. ***Ans. (c)***

We are provided with the POS expression

$$L = (\bar{X} + \bar{Z})(X + Y)1$$
$$= (\bar{X} + \bar{Z})(X + Y)(X + \bar{X})$$
$$L = (\bar{X} + \bar{Z})\ (X + \bar{X}Y)$$
$$= \bar{X}Y + \bar{Z}X + \bar{X}Y\bar{Z}$$
$$L = \bar{X}Y(1 + \bar{Z}) + \bar{Z}X$$
$$= \bar{X}Y + \bar{Z}X$$

13. ***Ans. (a)***

$$F = A + A\bar{B} + A\bar{B}C$$
$$F = A[1 + \bar{B} + \bar{B}C]$$
$$F = A$$

There is no need of any NAND gate to realize A since it is given input.

14. ***Ans. (a)***

15. ***Ans. (c)***

16. ***Ans. (b)***

A K-map is used to simplify the expressions thus it minimizes the number of gates of a digital circuit. The fan-in of a gate is the number of inputs connected to the gate without any degradation in the voltage levels.

Thus K-map minimizes the number of gates and fan-in of a digital circuit.

17. ***Ans. (d)***

A function with don't care combinations is simplified to obtain minimal SOP expression the value can be assigned to selected don't care combination. This is done order to increase the number of 1's in the selected groups, wherever further simplification is possible.

Also, a don't care combination need not be used in grouping if it does not cover a large number of 1's.

18. ***Ans. (b)***

X	Y	Z
0	0	1
0	1	$0 \rightarrow (X+\bar{Y})$
1	0	1
1	1	$0 \rightarrow (\bar{X}+\bar{Y})$

$$F = (X+\bar{Y})(\bar{X}+\bar{Y})$$

19. ***Ans. (d)***

$$F = AC + B\bar{C}$$

$$F = AC\cdot 1 + B\bar{C}\cdot 1$$

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

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

20. ***Ans. (c)***

21. ***Ans (d)***

$$X(X+\bar{X}Y)Z(X+Y+Z)$$

$$= (XX + X\bar{X}Y)Z(X+Y+Z)$$
$$= (X + 0)Z(X + Y + Z)$$
$$= XZX + XZY + XZZ$$
$$= XZ + XZY + XZ$$
$$= XZ\,[1 + Y + 1]$$
$$= XZ[1]$$
$$= XZ$$

22. ***Ans. (b)***

$$F = X \oplus Y \oplus XY$$

$$= X \oplus Y[\bar{Y}(XY) + Y(\overline{XY})$$

$$= X \oplus [0 + Y(\bar{X}+\bar{Y})]$$

$$= X \oplus Y\bar{X}$$

$$= \bar{X}(Y\bar{X}) + X(\overline{Y\bar{X}})$$

$$= \bar{X}Y + X(\bar{Y}+X)$$

$$= \bar{X}Y + X\bar{Y} + X$$

$$= \bar{X}Y + (\bar{Y}+1)X$$

$$= X + \bar{X}Y$$

$$F = (X + Y)$$

23. ***Ans. (c)***

$$F = (A+B)(\bar{A}+C)\cdot 1$$

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

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

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

$$= \bar{A}B + AC(1+B)$$

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

24. ***Ans. (d)***

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

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

$$= (A + B)$$

25. ***Ans. (b)***

$$A + BC = (A + B)(A + C)$$

(distributive property)

26. ***Ans. (c)***

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

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

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

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

27. ***Ans. (a)***

$$(\bar{A}BC + D)\,(\bar{A}D+\bar{B}\bar{C})$$

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

$$= \bar{A}BCD + 0 + D\bar{A} + \bar{B}\bar{C}D$$

$$= \bar{A}D(1+BC) + \bar{B}\bar{C}D$$

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

28. ***Ans. (c)***

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

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

$$= \bar{A} + 1$$

$$= 1$$

29. ***Ans. (d)***

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

$$= \overline{(x\bar{y})}\,\overline{(\bar{x}y)}$$

$$= (\bar{x} + \bar{\bar{y}})(\bar{\bar{x}} + \bar{y})$$

$$= (\bar{x} + y)(x + \bar{y})$$

$$= \bar{x}x + \bar{x}\,\bar{y} + xy + y\bar{y}$$

$$= 0 + \bar{x}\,\bar{y} + xy + 0$$

$$= \bar{x}\,\bar{y} + xy$$

30. ***Ans. (a)***

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

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

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

$$= A + (\bar{B} + \bar{A})\,(1)$$

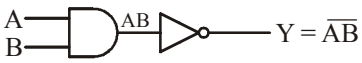
$$= A + \bar{A} + \bar{B})$$

$$= 1 + \bar{B}$$

$$= 1$$

31. ***Ans. (d)***

A NAND gate is a contraction of NOT-AND gates. It has two or more inputs and one output.



$\Rightarrow$

Now according to De-morgan's theorem the complement of a product is equal to the sum of complements.

$$Y = \overline{AB}$$

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

32. ***Ans. (c)***

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

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

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

$$= (\bar{A} + B)\left[(A\bar{B} + (A + \bar{B} + 1)\bar{C}\right]$$

$$= (\bar{A} + B)\left[A\bar{B} + \bar{C}\right]$$

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

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

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

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

33. ***Ans. (b)***

34. ***Ans. (c)***

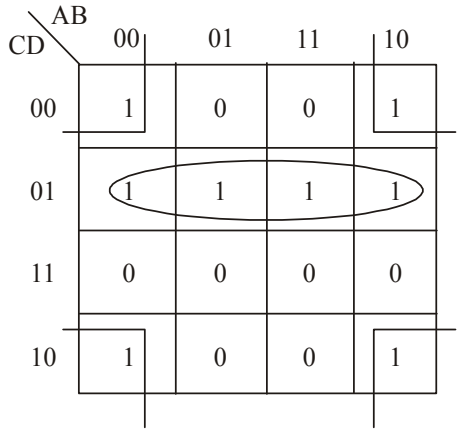
35. ***Ans. (b)***

36. ***Ans. (a)***

37. ***Ans. (a)***

38. ***Ans. (a)***

39. ***Ans. (d)***

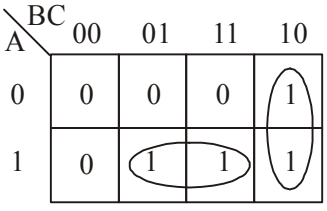


$$X = \bar{C}D + \bar{B}\bar{D}$$

40. ***Ans. (a)***

41. ***Ans. (c)***

$$F = AB + AC + \bar{C}B$$



$$F = AC + B\bar{C}$$

42. ***Ans. (c)***

$$F = A\left[B + C(\overline{AB + AC})\right]$$

$$F = A\left[B + C\overline{A(B + C)}\right]$$

$$F = A\left[B + C(\bar{A} + \bar{B}\bar{C})\right]$$

$$F = AB + AC[\bar{A} + \bar{B}\bar{C}]$$

$$F = AB$$

43. ***Ans. (b)***

RS \ PQ	00	01	11	10
00	0	0	0	01
01	1	0	0	1
11	1	0	0	1
10	0	(1)	0	0

$$Y = \bar{Q}S + \bar{P}QR\bar{S}$$

44. ***Ans. (b)***

45. ***Ans. (c)***

C \ AB	00	01	11	10
0		(1)		(1)
1	(1)		(1)	

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

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

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

$$= A \oplus B \oplus C$$

46. ***Ans. (c)***

47. ***Ans. (d)***

For n variables, the number of switching functions

$$= 2^{2^n}$$

For $n = 3$

Number of switching functions $= 2^{2^3} = 2^8 = 256$

48. ***Ans. (c)***

A K-map is used to simplify the expressions thus it minimizes the number of gates of a digital circuit. The fan-in of a gate is the number of inputs connected to the gate without any degradation in the Voltage levels. Thus K-map minimizes the number of gates and fan-in of a digital circuit.

49. ***Ans. (d)***

$$Y = f(A, B)$$
$$= \Pi M\ (0, 1, 2, 3)$$

B \ A	0	1	
0	0	0	$\Rightarrow = y = 0$
1	0	0	

Thus output is 0 for all inputs. It is independent of the input.

50. ***Ans. (b)***

$$f(v, w, x, y, z) = x + \bar{y}z$$

vw \ xyz	000	001	011	010	110	111	101	100
00	0	1	0	0	1	1	1	1
01	0	1	0	0	1	1	1	1
11	0	1	0	0	1	1	1	1
10	0	1	0	0	1	1	1	1

There are 20 minterms in the function.

❑❑❑