Class XII UNIT 4: BOOLEAN ALGEBRA

- 1. Define Binary logic?
- 2. What is a Boolean Operation?
- 3. Define a Boolean function?
- 4. Define a Boolean Expression?
- 5. Name the three primary and secondary operators of Boolean algebra? State any four postulates of Boolean algebra?
- 6. Define Idempotent Law?
- 7. Define Absorptive Law?
- 8. Define Involution Law?
- 9. What is De Morgan's Theorem?
- 10. State the principal of duality?
- 11. State the steps required to calculate the dual of any expression?
- 12. Define the Sum of products format of a Boolean expression?
- 13. Define the product of Sums format of a Boolean expression?
- 14. What is a Karnaugh map?
- 15. Draw the truth table of NAND gate?
- 16. What are Universal Gates? Name any two Universal Gates?
- 17. What is a Minterm?
- 18. What is a Maxterm?
- 19. What is a Cannical Sum of Products?
- 20. What is a Canonical Product of Sums?
- 21. State the total Number of combinations possible for a three input gate?
- 22. Draw a logical circuit diagram for the following Boolean expression: A.(B+C).
- 23. Convert the following Boolean expression into its equivalent Canonical Sum of Products Form (U'+V'+W'). (U+V'+W'). (U+V+W)
- 24. Draw the logical Circuit Diagram for the following Boolean Expression: (A'.B').+(C.D')
- 25. Write the equivalent Canonical Product of Sum for the following expression. $F(A,B,C) = \Sigma (1,2,3,4)$
- 26. Write the SOP form of a Boolean function G, which is represented in a truth table as follows:

Р	Q	R	<i>f</i> (G
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	0

27. Write the equivalent Boolean expression for the following Logic Circuit:



28. Write the equivalent Boolean expression for the following Circuit



29. For the given truth table, give canonical sum-of-products(SOP) and canonical product-of-sum (POS) expression.

Х	Y	Z	F o/P
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	0
1	1	1	1

- 30. Write the principal of Duality and write the dual of the Boolean Expression: (B' + C) + A'
- 31. Interpret the following logical circuit as Boolean expression.



- 32. Prove that **XY + YZ + YZ' = Y**
- 33. Write the equivalent Boolean expression for the following logic circuit



- 34. Express the F(X, Z) = X + X'Z into canonical SOP form.
- 35. Write the equivalent canonical POS expression for the following SOP expression: $F(x,y,z) = \Sigma (0, 2, 5,6).$
- 36. Write the equivalent Boolean Expression for the following Logic Circuit 2



37. Write the equivalent Boolean Expression F for the following circuit diagram : 2



38. Write the equivalent Boolean Expression F for the following circuit diagram : 2



- Convert the following Boolean expression into its equivalent Canonical Sum of Product Form((SOP) (X'+Y+Z').(X'+Y+Z).(X'+Y'+Z')
- 40. Convert the following Boolean expression into its equivalent Canonical Product of Sum form (POS): A.B'.C + A'.B.C + A'.B.C'
- 41. Draw a Logical Circuit Diagram for the following Boolean expression: A.(B+C')
- 42. Prove that XY+YZ+YZ'=Y algebraically
- 43. Design (A+B).(C+D) using NOR Gate.
- 44. Reduce the following Boolean expression using the K-map.

 $F(A,B,C,D) = \Sigma (0, 1, 2, 4, 5, 7, 8, 9, 10, 11, 14)$

45. Reduce the following Boolean expression using the K-map.

a. F(A,B,C,D)= Σ (0, 1, 2, 3, 4, 5, 7, 9, 11, 12, 13, 15);

- 46. If **F**(a,b,c,d) = Σ(1, 3, 4, 5, 7, 9, 11, 12, 13, 15) obtain the simplified form using K-Map.
- 47. Reduce the following Boolean expression using K-map:
 - a. $H(U, V, W, Z) = \Sigma (0, 1, 4, 5, 6, 7, 10, 11, 12, 13, 14, 15)$
- 48. Reduce the following Boolean expression using K-map:
 - a. $H(U, V, W, Z) = \Sigma (0, 1, 4, 5, 6, 7, 10, 11, 12, 13, 14, 15)$
- 49. Reduce the following Boolean expression using K-Map
 - a. F(A, B, C, D) = S (0, 1, 3, 4, 5, 7, 8, 9 11, 12, 13, 15) obtain the simplified from using K-Map.
- 50. Reduce the following Boolean expression using K-map
 - a. $F(A,B,C,D) = \Sigma (1, 3, 4, 5, 7, 9, 11, 12, 13, 14)$

51. Reduce the following Boolean expression using K-Map:

a. $F(P,Q,R,S)=\Sigma(0,3,5,6,7,11,12,15)$

52. Reduce the following Boolean expression using K-Map:

a. F(A,B,C,D)=П(0,1,3,5,6,7,10,14,15)

53. If $F(P,Q,R,S) = \Pi$ (3,4,5,6,7,13,15), obtain the simplified form using K-Map.

54. Reduce F(a,b,c,d)=Σ(0,2,4,5,7,8,10,12,13,15)

- 55. If $F(a,b,c,d)=\Sigma(0,2,4,5,7,8,10,12,13,15)$, obtain the simplified form using K-Map.
- 56. If $F(a,b,c,d) = \Sigma(0,3,4,5,7,8,9,11,12,13,15)$, obtain the simplified form using KMap
- 57. Obtain a simplified form for a boolean expression a. $F(U,V,W,Z) = \pi (0,1,3,5,6,7,10,14,15)$
- 58. Reduce the following boolean expression using K-Map
 - a. $F(A,B,C,D) = \Sigma(5,6,7,8,9,12,13,14,15)$