TEST

DIGITAL LOGIC

Time: 60 min.

Directions for questions 1 to 30: Select the correct alternative from the given choices.

1. What is the range of signed decimal numbers that can be represented by 4-bit 1's complement notation?
(A) –7 to + 7 (B) –16 to +16
(C) –7 to +8 (D) –15 to +16

2. Which of the following signed representation have a unique representation of 0?
(A) Sign-magnitude (B) 1's complement
(C) 0's complement (D) 2's complement

3. Find the odd one out among the following
(A) EBCDIC (B) GRAY
(C) Hamming (D) ASCII

4. Gray code for number 8 is
(A) 1100 (B) 1111
(C) 1000 (D) 1101

5. Find the equivalent logical expression for $z = x + \bar{x}y$
(A) $z = xy$ (B) $Z = \bar{x}y$
(C) $Z = \bar{x} + y$ (D) $Z = x + y$

6. The number of distinct Boolean expression of 3 variables is
(A) 256 (B) 16
(C) 1024 (D) 65536

7. The Boolean expression for the truth table shown is

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

(A) $Y(X + Z)(\bar{X} + \bar{Z})$ (B) $Y(X + \bar{Z})(\bar{x} + Z)$
(C) $\bar{Y}(X + \bar{Z})(\bar{x} + Z)$ (D) $\bar{Y}(X + Z)(\bar{X} + \bar{Z})$

8. The number of essential prime implicants for the Boolean functions shown in the given K-map.

XY \ WZ	00	01	11	10
00	1	1	0	1
01	1	0	0	1
11	1	0	0	0
10	1	0	0	1

(A) 4 (B) 5
(C) 6 (D) 8

9. The number of product terms in the minimized SOP from is

1	0	0	1
0	D	0	0
0	0	D	1
1	0	0	1

(A) 2 (B) 4
(C) 5 (D) 3

10. The minimum number of 2 input NAND gates needed to implement $Z = XY + VW$ is
(A) 2 (B) 3
(C) 4 (D) 5

11. The operation $\bar{a} \oplus \bar{b}$ represents
(A) $ab + \bar{a}\,\bar{b}$ (B) $\bar{a}b + \overline{ab}$
(C) $a\bar{b} + \bar{a}b$ (D) $a - \bar{b}$

12. Find the dual of $X + [Y + XZ] + U$
(A) $X + [Y(X + Z)] + U$ (B) $X(Y + XZ)U$
(C) $X + [Y(X + Z)]U$ (D) $X[Y(X + Z)]U$

13. The simplified form of given function $AB + BC + A\bar{C}$ is equal to
(A) $AB + A\bar{C}$ (B) $A\bar{C} + BC$
(C) $\bar{A}C + BC$ (D) $A\bar{B} + A\bar{C}$

14. Simplify the following

WX \ YZ				
	1	1	0	1
	1	1	0	1
	0	0	1	1
	0	0	0	0

(A) $\bar{W}\bar{Y} + \bar{W}\bar{Z} + WXY$
(B) $\bar{W}\bar{X} + \bar{W}\bar{Z} + WXY$
(C) $WY + WYZ + WXY + XY\bar{Z}$
(D) $\bar{W}\bar{X} + \bar{Y}\bar{Z} + \bar{W}\bar{Z}$

15. Simplify the following
$F = ABCD + A\bar{B}CD + \bar{A}C\bar{B}D + \bar{A}BCD$
(A) CD (B) BC
(C) AB (D) $\bar{C} + \bar{D}$

16. Find the equivalent Boolean expression for $AC + B\bar{C}$
(A) $\bar{A}C + B\bar{C} + AC$
(B) $ABC + A\bar{B}C + AB\bar{C} + \bar{A}B\bar{C}$
(C) $ABC + A\bar{B}C + AB\bar{C} + \bar{A}\bar{B}\bar{C}$
(D) $\bar{A}C + B\bar{C} + \bar{A}\bar{C}$

17. Simplify the following expression

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

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

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

18. If $A = 1$ in the logic equation $[A + C\{\bar{B} + (\bar{C} + A\bar{B})\}]$ $[\bar{A} + \bar{C}(A + B)] = 1$, then

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

(C) $C = 1$ (D) $C = 0$

19. Which is the odd function with 3 Boolean variables in it

(A) $\Sigma(0, 3, 5, 6)$ (B) $\Sigma(0, 2, 4, 6)$

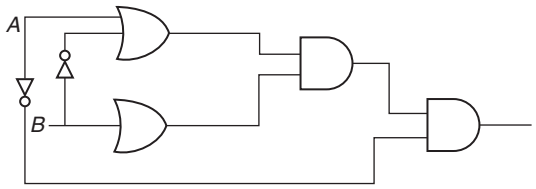
(C) $\Sigma(1, 2, 4, 7)$ (D) $\Sigma(1, 3, 5, 7)$

20. Which of the following expressions is/are incorrect?

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

(C) $\overline{\overline{a}\;\overline{b}} = \bar{a} + \bar{b}$ (D) $\overline{\overline{a+b}} = \bar{a}\,\bar{b}$

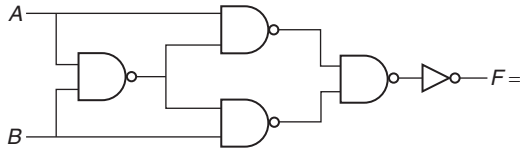
21. The simplified form of logic circuit is



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

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

22. The circuit shown in figure is equivalent to —— gate.



(A) X-OR gate (B) EX-NOR gate

(C) Half adder (D) Half subtractor

23. The truth table of the circuit shown in figure

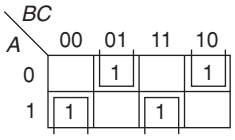
A	B	C	Z
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

The Boolean expression for Z

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

(C) $\overline{\overline{(\bar{A}+B)}\,\overline{(B+\bar{C})}}$ (D) All of the above

24. A combinational circuit has input A, B and C and its K-map is as shown in figure. The output of the circuit is given by



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

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

25. Which of the following two 2-input gates will realize the Boolean expression $X(P, Q, R) = \pi(0, 5)$

(A) AND and OR (B) NAND and OR

(C) AND and X-OR (D) OR and X-OR

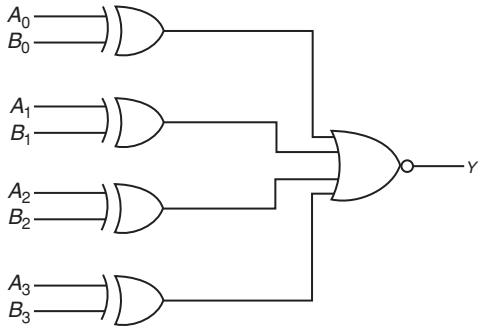
26. Simplify the given function

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

(A) $\bar{x}y + \bar{y}\bar{z} + xz$ (B) $\bar{x}\,\bar{z} + x\bar{y} + yz$

(C) Both (A) and (B) (D) $\bar{x}\,\bar{z} + \bar{x}y + x\bar{y} + xz$

27. Figure below shows a digital circuit, which compares two numbers $A_0\ A_1\ A_2\ A_3$, $B_0\ B_1\ B_2\ B_3$. Choose the pair of correct input number to get output $Y = 0$.



(A) 1100, 1100 (B) 0110, 0110

(C) 1011, 0010 (D) 1011, 1011

28. How many 3 to 8 line decoders with an enable input are required to build 6 of 34 decoder?

(A) 6 (B) 2

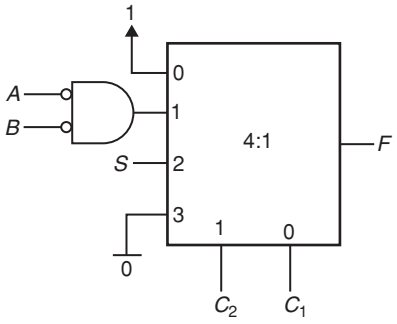
(C) 9 (D) 4

29. It is required to construct a 2^n to 1 multiplexer by using 2-to-1 multiplexer only. How many of 2-to-1 multiplexer are needed?

(A) n (B) 2^{2n}

(C) 2^{n-1} (D) $2^n - 1$

30. Consider the following circuit



Which one of the following give the function implemented by the MUX based digital circuit?

(A) $F = C_2 \cdot \overline{C_1}S + \overline{C_2}C_B(\overline{A} + \overline{A})$

(B) $F = \overline{C_2} \cdot \overline{C_1} + C_2C_1 + C_2\overline{C_1}S + \overline{C_2}C_1\,\overline{AB}$

(C) $F = \overline{AB} + S$

(D) $F = \overline{C_2} \cdot \overline{C_1} + C_2 \cdot \overline{C_1}S + \overline{C_2}C_1\overline{A} \cdot \overline{B}$

Answer Keys

1. A	**2.** D	**3.** C	**4.** A	**5.** D	**6.** A	**7.** A	**8.** A	**9.** A	**10.** B
11. C	**12.** D	**13.** B	**14.** A	**15.** A	**16.** B	**17.** A	**18.** D	**19.** C	**20.** D
21. D	**22.** B	**23.** B	**24.** D	**25.** D	**26.** C	**27.** C	**28.** C	**29.** D	**30.** D