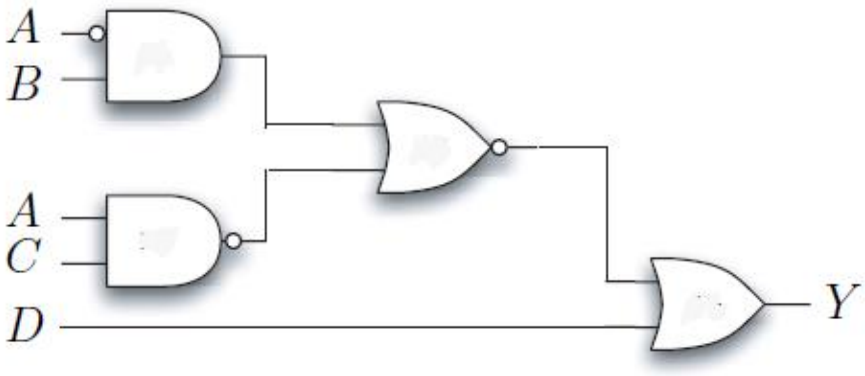
DIGITAL ELECTRONICS

QUESTION BANK

UNIT-1,2

1. Evaluate the following:
   (a). Convert to hex: 11001001.10112 =
   (b). Convert to decimal: 110101.012 =
   (c). Convert to binary: 98.2510 =
   (d)Convert to decimal: 2A.416 =
   (e)find 110010 /110
   (f)find 101011/100
   (g)find 11001101-1110011
   (h) find 101111-111111
   (i)find 12-24 using 2's complement
   (j)find 1110011-11111111 using 2's complement
   (k)find 1101101*110011
   (l)find 10011*111100
   (o) Convert the following
      (a) $(1248.56)_{10} = (?)_2$ (b). $(0.6234)_{10} = (?)_8$ (c). $(4056)_{16} = (\ ?\ )_2$

2. Write the Boolean expression equivalent to the following logic circuit. Do not simplify



3. Draw the logic circuit realization of the following Boolean expression as stated. Do not simplify! You may draw inverters explicitly or use inversion bubbles, as you choose.

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

4. Write the complete truth table for the Boolean expression of question number-3 and 2
5. Perform in BCD using 9's complement
(a). $(83)_{10}$- $(21)_{10}$ (b). $(274)_{10}$ - $(86)_{10}$ (c) $(90)_{10} - (10)_{10}$

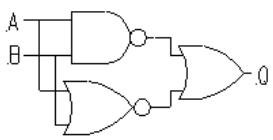
6. Convert the Boolean equation of 3 to its DeMorgan equivalent.
7. Draw the logic circuit for the DeMorgan equivalent Boolean equation you found in 5. You may use inverters or inversion bubbles, as you choose.
8. Explain gray code and convert 0 to 15 its corresponding gray code?
9. Simplify the following Boolean expression as far as possible, using the postulates and theorems of Boolean algebra.

$$f(w,x,y) = w\overline{x}y + wx + w\overline{y} + wx\overline{y}$$

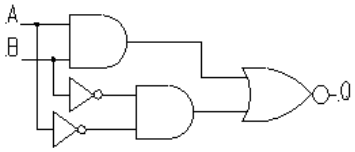
10. Simplify the following expression using the postulates and theorems of Boolean algebra. Eliminate all group complements. Justify each step by stating or referring to the Boolean theorem or postulate you use. Don't skip any steps! Hint: De-Morgan's theorem!

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

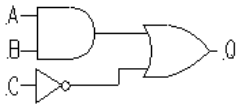
11. Perform
(a). $(1010.010)_2$ - $(111.111)_2$, $(111101)_2$ - $(100101)_2$, $(1011)_2$ – $(101)_2$
(b). $(1001)_2$ X $(1000)_2$, $(1001)_2$ X $(101)_2$, $(1001.11)_2$ X $(101.1)_2$
(c). $(110110)_2$ / $(101)_2$, $(11110)_2$ / $(101)_2$, $(110111.1)_2$ / $(101)_2$,
(d) $(11011)_2$ + $(10111)_2$, $(1011)_2$ + $(1101)_2$, $(1011)_2$ + $(1101)_2$ + $(1001)_2$ + $(1111)_2$
12.Write a boolean expression for the output, Q, in terms of the inputs A, B, and C.



(a)



(b)



(c)

13.Draw a circuit to realize each of the expressions using AND gates, OR gates and Invertors.

a. $W = A \cdot B + \overline{C}$
b. $X = \overline{(\overline{A} \cdot B)} + \overline{(A \cdot \overline{B})}$
c. $Y = \overline{(\overline{A} \cdot B)} + (A \cdot \overline{B})$
d. $Z = (A + B + \overline{C}) \cdot (A + \overline{B}) \cdot (\overline{A} + B + C)$

14.Realize AND,OR,NOT,XOR,XNOR using NAND gate only
15. Construct basic gate using NOR gate write the truth table and logic diagram?
16.Construct basic gate using NAND gate write the truth table and logic diagram?
17.Realize AND,OR,NOT,XOR,XNOR using NOR gate only
18.Define Logic Gates.

19.Define following gates and draw logic circuit diagram
(a) OR Gate
(b) AND Gate
(c) NOT Gate
(d) NAND Gate
(e) NOR Gate

20.Construct a logic diagram for expression A. B + C
21.Construct a logic diagram for expression A. B + B.C
22.Construct a logic diagram for expression B. (A +C)
23.Find truth table of X + Y = Y + X
24.Prepare a truth table of XY= YX
25.Prepare a truth table X(X +Y) = X
26. Define canonical Minterm formula and canonical Maxterm formula with an example for each.
27.Perform in BCD
(a) $(57)_{10}+(26)_{10}$ (b) $((275)_{10}+(493)_{10}$
28.Explain Excess-3 Code (XS-3) justify its self-complementary code?
29. Define Propagation delay and explain timing diagram for AND gate
30.Express the given function in the product of sums, also draw its circuit and truth table. $y = \bar{A}BC + \bar{A}\,\bar{B}\bar{C} + AB$
31.Realize Exclusive OR gate using NAND and NOR with Boolean expression simplification method.
32.Construct the truth table and express the given function in both Maxterm and Minterm form $f(A,B,C,D) = (A + B + \bar{C})(A + \bar{B} + \bar{C})(\bar{A} + B + \bar{C})(\bar{A} + \bar{B} + \bar{C})$
33.Simplify the following functions using Boolean algebra and the K-map.

$$f(A,B,C,D) = \sum m(1,2,4,6,9)$$
$$f(A,B,C,D) = \sum m(0,2,3,6,7)$$
$$F(A,B,C,D) = \pi M(1,4,5)$$

F = (A+B+C) (A+B+C') (A+B'+C') (A'+B+C') (A'+B'+C) (A'+B'+C')
34.Use the switching algebra to find a minimal SOP expression for the function $f(A,B,C,D) = ABC + ABD + \bar{A}B\bar{C} + CD + B\bar{D}$
35.Simplify the following functions using Boolean algebra and the K-map (Don't care in k-map)

1) $F(A,B,C) = \sum m(2,3,4,5) + \sum d(6,7)$
2) $F(A,B,C,D) = \sum m(1,3,7,11,15) + \sum d(0,2,5)$
3) $F(A,B,C,D) = \sum m(0,2,5,9,15) + \sum d(6,7,8,10,12,13)$
4) $F(A,B,C,D) = \sum m(1,3,7) + \sum d(0,5)$
5) $F(A,B,C,D) = \sum m(1,3,7,5,9) + \sum d(6,12,13)$
6) $F(A,B,C,D) = \sum m(1,6,10,11,12,13,15) + \sum d(4,5,7,8,14)$
7) $F(A,B,C,D) = \pi M(0,6,8,13) \cdot \sum d(2,4,10)$
8) $F(A,B,C,D) = \pi M(1,3,7,11,15) \cdot \sum d(5,9,13)$
9) $F(A,B,C,D) = \pi M(0,1,2,4,5,6,10,12,13) \cdot \sum d(53,7,8,9,14,15)$

36. What are signals? Explain the types of signals.

37. List out the types of binary codes in digital electronics.
38. Define duality theorem.