Total number of printed pages: 2

DIPLOMA (D) / III / DIE304

2024

DIGITAL ELECTRONICS

Full Marks: 100

Time: Three hours

The figures in the margin indicate full marks for the questions.

*Answer any **five** questions.*

1. a) Convert the following numbers- 10 x 1 = 10

   i) $(47)_8$ to Decimal ii) $(112)_8$ to Hex

   iii) $(10111)_2$ to Decimal iv) $(A2F)_{16}$ to Binary

   v) $(21.75)_{10}$ to binary vi) $(1000)_2$ to BCD

   vii) $(11001)_{BCD}$ to binary viii) $(2E)_H$ to Decimal

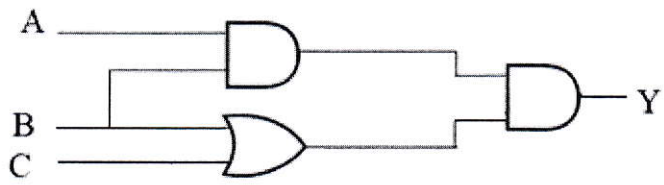
   ix) $(111011)_2$ to gray x) $(101110)_{gray}$ to binary

   b) Perform BCD addition. 2 + 2 = 4

   i) $(114)_{10} + (112)_{10}$ ii) $(248)_{10} + (135)_{10}$

   c) Perform binary subtraction using 2's complement technique. 3 + 3 = 6

   i) $(10)_{10} - (08)_{10}$ ii) $(21)_{10} - (25)_{10}$.

2. a) 

5

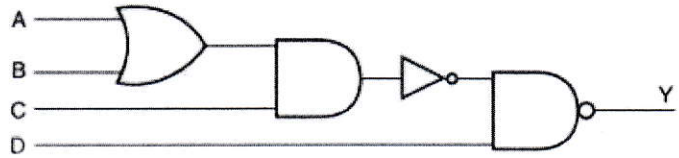
   For the diagram above, write its output expression and find out the truth table.

   b) Show that- $(A + B).(A + \bar{B}).(\bar{A} + B) = A.B$ 2

   c) For the Boolean expressions given below, find out the truth table and draw the logic circuit using basic gates. 4 + 4 = 8

   i) $Y = (\overline{A}.B + A.\overline{B}) + C$ ii) $Y = (\overline{A}.B + \overline{B}.C).B$

d) Find out the Truth Table for the logic diagram given below. 5



3. a) Minimize the following Boolean Expressions- 2 + 2 = 4

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

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

b) Prove that- 3 X 2 = 6

i) $X.(X + Y) = X$ ii) $(\overline{X} + Y).Y = X.Y$ iii) $(A + B).(A + \overline{B}) = A$

c) State and prove De-Morgan's theorems- 6

d) Write the dual and complement of the following Boolean expressions- 2 + 2 = 4

i) $(A + \overline{BC}) + B$ ii) $(\overline{A}.B) + (A + \overline{B})$

4. a) Minimize using K-Map technique write the final expression- 4 + 6 = 10

i) $F(A, B, C) = m(0,1,3,5,7)$

ii) $F(A, B, C, D) = m(4,5,6,7,12,13,14,15) + d\,(0,1,8)$

b) Explain the working of a half-adder circuit with the help of its truth table and logic diagram. 4

c) What is a full subtractor? Write its truth table, output expressions and draw the logic diagram. 1+5=6

5. a) Explain the working of a 4-bit binary adder with proper block diagram. 10

b) What is a multiplexer? Explain the working of a 4:1 Mux with logic diagram. 2+8=10

6. a) Implement a half-subtractor with a 2-to-4 line Decoder and few gates. 6

b) Explain the working of a 4-to-2 Encoder. 6

c) Differentiate between combinational and sequential circuits and explain the working of J-K flip-flop with proper diagram and its characteristic table. 2 + 6 = 8