Total number of printed pages: 3

DIPLOMA (D) / III / DIE304

2022

DIGITAL ELECTRONICS

Full Marks: 100

Time: Three hours

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

*Answer any **five** questions.*

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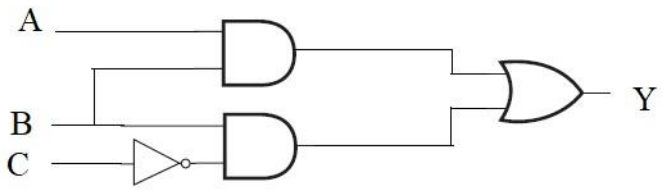
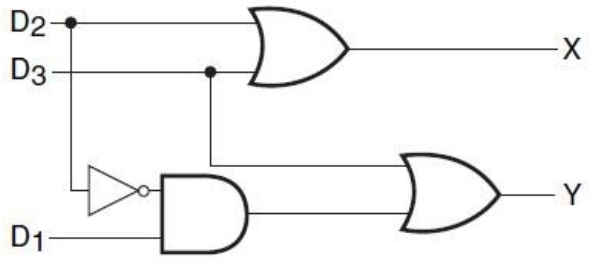
1.	a)	Convert the following numbers- i) $(77)_8$ to Decimal ii) $(45)_8$ to Hex iii) $(10011110)_2$ to Decimal, iv) $(256)_{16}$ to Binary, v) $(29.25)_{10}$ to BCD, vi) $(101101)_2$ to BCD, vii) $(101001)_{BCD}$ to binary, viii) $(A58)_H$ to Decimal, ix) $(111011)_2$ to gray x) $(101110)_{gray}$ to binary	10 x 1 = 10
	b)	Perform the following operations using 8-bit 2's complement technique. i) $(+14)_{10} + (-12)_{10}$ ii) $(-21)_{10} + (-35)_{10}$	2 + 2 = 4
	c)	Name the Universal gates. Explain with an example why these are called Universal gates.	4
	d)	Implement a NOT gate using an EX-OR gate.	2
2.	a)	 For the diagram above, write its output expression and find out the truth table.	4

	b)	 For the diagram above, write the output expressions for X and Y, and find out the truth tables for both X and Y.	3 + 3 = 6
	c)	Show that- $\bar{A}.B + A.\bar{B} + A.B = A + B$	2
	d)	For the Boolean expressions given below, find out the truth table and draw the logic circuit using basic gates. i) $Y = (\overline{A}.B + A.\overline{B}).C$ ii) $Y = \overline{A}.B + \overline{B}.C$	4 + 4 = 8
3.	a)	Minimize the following Boolean Expressions- i) $Y = \bar{A}.B.C + A.\bar{B}.C + A.B.\bar{C} + A.B.C$ ii) $Y = (A + B + \overline{C})(A + B + C)(\overline{A} + B + C)$	2 + 2 = 4
	b)	Prove that- i) $X.(X + Y) = X$ ii) $(\overline{X} + Y).Y = X.Y$ iii) $(A + B).(A + \overline{B}) = A$	3 X 2 = 6
	c)	State and prove De-Morgan's theorems-	6
	d)	Write the dual and complement of the following Boolean expressions- i) $A + BC$ ii) $(\overline{A} + B).(A + \overline{B})$	2 + 2 = 4
4.	a)	Minimize using K-Map technique write the final expression- i) $F(A, B, C) = m(0,1,2,6,7)$ ii) $F(A, B, C, D) = m(4,5,6,7,12,13,14,15) + d(0,1,11)$	4 + 6 = 10

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	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.	2+8=10
6.	a)	Write the truth table of a 3-to-8 line Decoder and explain its working.	8
	b)	What is a magnitude comparator?	2
	c)	A digital circuit has three input lines and one output line such that the output goes HIGH if any two or more input lines are LOW. Find out the truth table, output expression and draw the logic circuit diagram by using as less number of gates as possible.	2+2+6=10

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