17333

21819

3 Hours / 100 Marks Seat No. | | | | | | | | |

Instructions : (1) All Questions are *compulsory.*

(2) Illustrate your answers with neat sketches wherever necessary.

(3) Figures to the right indicate full marks.

(4) Assume suitable data, if necessary.

(5) Use of Non-programmable Electronic Pocket Calculator is permissible.

Marks

1. (A) Attempt any SIX of the following : **12**

(i) Define digital system and give its two applications.

(ii) State any four Boolean Laws.

(iii) Draw logical symbol and truth table of X-OR gate.

(iv) Convert $(352.75)_{10} = (?)_2$

(v) List Universal gates. Why they are called as universal gate ?

(vi) Name the IC for digital comparator and ALU.

(vii) Draw T flip-flop using NAND gate.

(viii) State advantages of digital system.

(B) Attempt any TWO of the following : **8**

(i) Subtract using 2's complement method :

(1) $(11101)_2 - (10010)_2$

(2) $(1010)_2 - (0110)_2$

(ii) State and prove Demorgan's theorem.

(iii) Convert the following :

(1) $(1011010110)_2 = (?)_{10}$

(2) $(576)_{10} = (?)_2$

(3) $(237)_8 = (?)_{10}$

(4) $(327.89)_{10} = (?)_{BCD}$

2. Attempt any FOUR of the following : **16**

(a) Derive AND gate and OR gate using NAND gate only.

(b) For the following logic expressions given below. $Y = \overline{A} \cdot B + A \cdot \overline{B}$

Do :

(i) Obtain truth table

(ii) Name the operation performed from the truth table

(iii) Realize this operation using basic gates

(iv) Realize this operation using only NOR gates.

(c) Design half subtractor circuit using K-Map.

(d) Minimize the following function using K-Maps :

$F = \Sigma m(0, 1, 2, 3, 11, 12, 14, 15)$

Realise the expression using basic gates.

(e) Draw the block diagram of ALU IC 74181 and explain function of all pins.

(f) Perform following binary operations :

(i) 1011011×101

(ii) $1101101 \div 1001$

3. Attempt any FOUR of the following : **16**

(a) Design 1 : 32 demultiplexer using 1 : 4 demultiplexer.

(b) Implement following logical expression using basic gates. $Y = \overline{A}\,\overline{B} + \overline{AC} + \overline{A}B$.

(c) Convert $F(A, B, C) = \Sigma m(1, 4, 5, 6, 7)$ in standard POS form.

(d) Differentiate between synchronous and asynchronous counter.

(e) Explain master slave JK flip-flop with neat diagram.

(f) State any four specifications of DAC.

4. Attempt any FOUR of the following : **16**

(a) Differentiate between RAM & ROM.

(b) Draw circuit diagram of R-2R type D to A convertor. Describe its working.

(c) Describe the function of present and clear terminals in JK flip-flop. Write truth table of it.

(d) Explain 2-bit synchronous counter with truth table and timing diagram.

(e) Draw block diagram of PISO shift register and describe its operations.

(f) Reduce following expression using K-map and implement it using NOR gates :

$Y = \pi M(1, 3, 5, 7, 8, 10, 14)$

5. Attempt any FOUR of the following : **16**

(a) State different applications of flip-flops.

(b) Draw block diagram of BCD to seven segment decoder using IC 7447 with its truth table.

(c) Compare weighted resistor DAC & R-2R DAC.

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(d) Perform the following using 9's complement :

(i) $(62)_{10} - (87)_{10}$

(ii) $(53)_{10} - (24)_{10}$

(e) Design 3-bit asynchronous up counter and describe its operations.

(f) Prove the following using algebraic theorems :

(i) $AB + \bar{A}B + \bar{A}\bar{B} = \bar{A} + B$

(ii) $A + \bar{A}B + A\bar{B} = A + B$

6. Attempt any TWO of the following : 16

(a) (i) Design full adder circuit using K-map. Implement using logic gates. **(6)**

(ii) Define and draw logical symbol of a demultiplexer. **(2)**

(b) (i) Differentiate between combinational and sequential logic circuits (2 points). **(2)**

(ii) State the applications of shift register. **(2)**

(iii) Draw the block diagram of 4-bit SISO shift register and explain its working with timing diagram. **(4)**

(c) (i) Draw neat diagram of RAMP ADC and explain its working. **(4)**

(ii) What are advantages and disadvantages of DAC ? **(4)**
