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

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

(2) Answer **each** next main question on a **new** page.

(3) Illustrate your answers with neat sketches **wherever** necessary.

(4) Figures to the **right** indicate **full** marks.

(5) Assume suitable data, if **necessary**.

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

(7) Mobile Phone, Pager and any other Electronic Communication devices are **not permissible** in Examination Hall.

Marks

1. A) Attempt **any six** :   **12**

   1) What is Positive logic and Negative logic in digital system ?

   2) Define : i) Propagation delay ii) Noise margin.

   3) Draw the symbol and T.T. of i) EX-OR ii) NAND gate.

   4) State De-Morgan's theorem.

   5) State any four Boolean laws.

   6) Solve the following :

      i) $(110101)_2 + (101101)_2$

      ii) $(1010)_2 - (1000)_2$ using 1's complement method.

   7) Draw the logic diagram of IC 7485.

   8) Define any two specifications of ADC.

   B) Attempt **any two** :   **8**

   a) Design OR and AND gate using NOR gate only.

   b) Perform BCD addition :

      i) $(264)_{10} + (668)_{10}$

      ii) $(454)_{10} + (379)_{10}$.

   c) Compare TTL and CMOS Logic family on the basis of propagation delay, power dissipation, Fan out and components used.

2. Attempt **any four** :   **16**

   a) Draw EX-OR gate using NAND gate only. Also write O/P of each gate.

   b) Given $Y = A\overline{B} + \overline{BC} + \overline{A}C$.

      Implement the logical expression using gates.

   c) Perform 2's complement substraction $(59)_{10} - (62)_{10}$.

   d) Simplify the following equation using K-map and realize it using logic gates.

      $Y = \Sigma m(0, 1, 2, 3, 8, 10) + \Sigma d(5, 7)$.

   e) Draw block diagram of Decimal to BCD encoder and write its truth table.

   f) Design Half adder using K-map and basic gates.

3. Attempt **any four** :   **16**

   a) Simplify using De-Morgan's theorem and realize it using basic gates :

      $Y = \overline{\left(A\overline{B} + \overline{A}\,\overline{B}\right)\left(AB + \overline{A}B\right)}$

   b) Draw the logical block diagram of 4 : 1 mux and describe its working. Give the expression for the o/p and draw the circuit diagram using gates.

   c) Draw the block diagram of BCD to seven segment decoder/driver using IC 7447. Also draw its Truth Table.

   d) Design 1 : 8 demux using basic gates.

   e) Explain different triggering methods used in Flip Flops.

   f) Explain working of PIPO with neat logic diagram and timing diagram.

4. Attempt **any four** :   **16**

   a) Draw 4-bit SISO shift register using D-F/F and explain its working with timing diagram.

   b) Explain successive approximation type ADC with neat diagram.

   c) Describe working of RS Flip Flop using NAND gates only.

   d) Explain the techniques used in elimination of Race-around condition.

   e) Define memory. Give classification of memory. Compare PROM and EPROM. (any 2 points)

   f) What is the need of data converters ? List specifications of DAC.

Marks

5. Attempt **any four** : 16

a) Convert the following :

i) $(366.54)_8 \rightarrow (?)_{10}$ and

ii) $(2015.32)_{10} \rightarrow (?)_{16}$

b) Draw the block diagram of sequential logic and state the importance of clock signal in it.

c) Simplify the following and realize it.

$$Y = A + \overline{A}\overline{B}C + \overline{A}\overline{B}\overline{C} + ABC + \overline{A}\overline{B}$$

d) Draw the circuit of ring counter and describe with timing diagram.

e) Describe block diagram of digital comparator and write truth table of 2-bit comparator.

f) Compare Synchronous and Asynchronous counter (any 4 points).

6. Attempt **any two** : 16

a) i) Convert the following SOP equation into std. SOP equation 2

$$Y = AB + \overline{A}B + A\overline{B}\overline{C}$$

ii) List any four applications of multiplexer and implement the following logic expression using 16 : 1 Mux. 6
$Y = \Sigma m(0, 3, 5, 6, 7, 10, 13)$

b) i) List two applications of flip flops. 2

ii) What is Modulus of counter ? Show the method to determine the no. of flip flops for a mod-52 counter. 2

iii) Draw symbol and truth table of negative edge triggered D-flip flop and positive edge triggered JK-flip flop. 4

c) i) List any four specifications of DAC. 2

ii) Draw neat block diagram of RAMP ADC and explain its working. 6

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