15162

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

Marks

1. Attempt **any five** :   **20**

   a) Convert the following decimal numbers into excess – 3 code.

   i) $(7)_{10}$ ii) $(45)_{10}$ iii) $(232.8)_{10}$

   b) Draw the logical diagram of OR gate and NOR gate using NAND gate only.

   c) Convert the following expression in standard SOP form. $Y = AB + AC + BC$.

   d) Compare between combinational and sequential logic circuits. (any 04 points).

   e) State any four features of PCF 8591.

   f) State different types of ROM and explain any one in detail.

   g) State the number of Flip Flops required to construct the following modulus of counter :

   i) 7   ii) 85   iii) 98   iv) 11

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

   a) Perform binary subtraction using 2's complement method $(11001)_2 - (1010)_2$.

   b) State DeMorgan's theorems and prove by Truth-table method for two variables.

   c) Give the expression of Grey code equivalent of 4-bit binary using K-map.

   d) Draw the circuit diagram of 3-bit asynchronous up/down counter using T-FF.

   e) Describe any four specifications of DAC.

   f) Compare volatile and non-volatile memories (any 4 pts.)

Marks

3. Attempt **any four** : 16

   a) Add $(532)_{10}$ and $(248)_{10}$ in BCD.

   b) Compare TTL and CMOS logic families on the basis of size, power, cost and speed.

   c) Minimize following expression using K-map f (P, Q, R, S) = $\sum$ m (0, 1, 4, 5, 7, 8, 9, 12, 13,15).

   d) Describe the working of 4-bit ripple counter with logic diagram and waveforms.

   e) State advantages and disadvantages of single slope ADC.

   f) Describe the working of Flash-memory.

4. Attempt **any four** : 16

   a) State the rules for BCD addition.

   b) Draw two input OR gate, using ECL logic family (only diagram).

   c) Realize full subtractor using K-map.

   d) Describe positive and negative edge triggering methods of clock with their logic symbol.

   e) Calculate the analog output of 4-bit DAC if the digital input is 1101. Assume VFS = 5V.

   f) Draw the logic diagram of 4-bit SIPO shift register and explain its working principle.

5. Attempt **any four** : 16

   a) Realize the following expression using K-map.

     Y = f(A, B, C, D) = $\sum$ m (0, 2, 3, 5, 6, 7, 10, 11) + d (8, 14, 15) and implement it.

   b) Simplify the following expression using Boolean laws.

     Y = (A + B) (A + C)

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

   c) Draw the circuit of master slave JK FF using NAND gate and list its advantages.

   d) Draw and explain the block diagram of successive approximation method ADC.

   e) Convert the given binary number into decimal, hexadecimal, octal and grey code $(10111101)_2$.

   f) Implement the following function using demultiplexer.

     F_1 = $\sum$ m (1, 2, 5, 6, 7, 11, 14)

     F_2 = π M (0, 1, 2, 5, 6, 7, 8, 11, 12, 15)

6. Attempt **any four** : 16

   a) Describe CMOS inverter with diagram.

   b) Design 32 : 1 multiplexer using 16 : 1 multiplexer and one 2 : 1 multiplexer.

   c) Describe the working of BCD to 7 segment decoder with truth table and circuit diagram.

   d) Design 3-bit synchronous counter and draw O/P waveform (only logic diagram, truth table and waveforms expected).

   e) Draw the circuit diagram of 4-bit R-2R ladder DAC and obtain its output voltage expression.

   f) Design 3 : 8 line decoder and give IC number for the same.

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