23124

3 Hours / 70 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.   **Attempt any FIVE of the following :**   **5 × 2 = 10**

   (a)   Construct OR gate using NAND gate.

   (b)   Define the term 'multiplexer'. State two examples of multiplexer.

   (c)   Implement T flip-flop using JK flip-flop. Write its truth table.

   (d)   Explain :

       (i)   Fan-in

       (ii)   Fan-out

       with respect to logic families.

   (e)   Define :

       (i)   Address bus

       (ii)   Data bus

   (f)   Identify the addressing mode of the instruction :

       (i)   MOVX@Ro, A

       (ii)   CJNE A, # data, rel

(g) Find the number of address lines required for

(i) 4 K RAM

(ii) 8 K ROM

2. **Attempt any THREE of the following :** **3 × 4 = 12**

(a) State and explain De-Morgan's first theorem.

(b) Design full adder using K-map. Draw circuit diagram with truth table.

(c) Solve the following SOP expressions with the help of K-map :

(i) $F(A, B, C, D) = \Sigma m (0, 1, 3, 4, 5, 7)$

(ii) $F(A, B, C) = \Sigma m (0, 1, 4, 5, 6, 7)$

(d) Write any two laws of Boolean algebra. Justify with the help of truth table.

3. **Attempt any THREE of the following :** **3 × 4 = 12**

(a) Explain any four addressing modes of 8051 microcontroller with one example each.

(b) Sketch diagram showing interfacing of two chips of RAM having size 2 K × 8 to 8051 microcontroller. Write its memory map.

(c) Minimize following Boolean equation using 'K' map : $Y = A\overline{B}C + \overline{A}\overline{B}C + ABC$ and implement using basic gates.

(d) List any eight features of microcontroller 8051.

4. **Attempt any THREE of the following :** **3 × 4 = 12**

(a) Explain different program development steps in assembly language programming.

(b) Compare between Harvard and Von-Neumann architecture. (any four points)

(c) Design 3-bit binary to gray code converter.

(d) Justify 'NOR gate is called as universal gate'. Sketch relevant diagram.

(e) Draw and explain the flag register of 8051 microcontroller.

5. **Attempt any TWO of the following :** **2 × 6 = 12**

    (a) Explain with neat diagram microcontroller based water level controller.

    (b) Develop an ALP to generate square wave of 1 kHz at port pin 1.4. Draw flowchart for it.

    (c) Draw architecture of 8051 microcontroller.

6. **Attempt any TWO of the following :** **2 × 6 = 12**

    (a) Explain power saving options :

        (i) Idle mode

        (ii) Power down mode

    (b) Develop an ALP for interfacing of LEDs with port 1 of 8051. Draw interfacing for the same.

    (c) Construct 3 bit asynchronous up-counter using flip-flop. Draw its timing diagram.

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