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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.   **Attempt any <u>FIVE</u> of the following:**   **10**

a) List four features of 8051 microcontroller.

b) State four advantages of embedded system.

c) Draw the format of IE register and state function of any two bits.

d) Give classification of embedded system.

e) Draw interfacing diagram of push buttons and LEDs with 89C51 microcontroller connected to port 1 and port 3 respectively.

f) Differentiate serial and parallel communication. (any four points)

g) State any four LCD commands and their description.

Marks

2.   **Attempt any THREE of the following:**   **12**

a) List the software development tools in an embedded system and state the function of any two.

b) Develop an 89C51 'C' program to toggle bits of P1 ports continuously with 250ms delay.

c) Draw the internal data memory structure of 89C51 and describe register banks.

d) Draw the labelled interfacing diagram to interface LED to P2.0 of 89C51. Write 89C51 'C' program to turn on and off LED after 10m sec delay.

3.   **Attempt any THREE of the following:**   **12**

a) Write logical operators in 'C' for AND, OR, EXOR and NOT for 89C51 and state one example of each.

b) Draw the interfacing diagram of ADC0808 with 89C51 microcontroller and write a program in embedded 'C' to read data from channel 1.

c) Describe IP register and state the interrupt priorities.

d) Differentiate synchronous and asynchronous communication. (any four points including data format)

4.   **Attempt any THREE of the following:**   **12**

a) Describe any four specifications of RTOS. Give any four examples of RTOS.

b) Differentiate between assembly language program and embedded 'C' with reference to the following points.

i)   Execution time

ii)   Time for coding

iii) Hex file size

iv)   Debugging

c) Give description of following pins of 89C51.

   i)   RESET

   ii)   ALE / $\overline{\text{PROG}}$

   iii) $\overline{\text{PSEN}}$

   iv) $\overline{\text{EA}}$ / V_{PP}

d) Write 89C51 'C' program to transfer the message "MSBTE" serially at 9600 baud rate continuously.

e) Explain the concept of intertask communication with diagram.

5.   **Attempt any TWO of the following:**   **12**

a) Draw the labelled interfacing diagram of 4 × 4 matrix keyboard with 89C51 microcontroller and expalin stepwise algorithm to read the key pressed.

b) Differentiate between I^2C with USB protocol with respect to

   i)   Data transfer rate

   ii)   Number of fields

   iii) Addressing bits

   iv) Application

c) Describe hard real time and soft real time systems with suitable example. State three characteristics of embedded systems.

6.   **Attempt any TWO of the following:**   **12**

a) Draw a diagram to interface a stepper motor to 89C51 and write a program in embedded 'C' to rotate stepper motor 90° in anticlockwise direction. Motor has step angle of 1.8 degree. Use the stepper motor in full step sequence.

b) Develop 89C51 'C' program to read number 1 from port 1, number 2 from port 2 and perform arithmetic and logical operations on numbers send result to port 3.

c) Compare 8031, 8051 and 8052 microcontrollers.
(any four points)

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