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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.

(8) Use of Steam tables, logarithmic, Mollier's chart is permitted.

Marks

1.   Attempt any FIVE of the following :   **10**

a) State any four features of micro-controller 89C51.

b) State two advantages and disadvantages of embedded system.

c) List the various serial and wireless communication protocols.

d) Draw a diagram to interface 4×4 matrix keyboard to 89C51 microcontroller.

e) State any two difference between synchronous and asynchronous data communication.

f) List the various software development tools of embedded system.

g) Give classification of embedded system.

Marks

2.   **Attempt any <u>THREE</u> of the following :**   **12**

     a)   Differentiate between assembly language and embedded C with reference to following points.

         i)   Execution time

         ii)   Time for coding

         iii)   Hex file size

         iv)   Debugging

     b)   Develop on 89C51 program to read a byte of data from P0. If it is greater than 99, send it to P0, otherwise send it to P2.

     c)   Draw a labelled diagram to interface a switch to pin P0.0 and a relay to pin P2.0 of 89C51.

     d)   List alternate functions of Port 3 of 89C51 microcontroller.

3.   **Attempt any <u>THREE</u> of the following :**   **12**

     a)   It the contents of Acc $= 0 \times 02$ and P1 $= 0 \times$ F3. State the result after execution of following statements independently.

         i)   result = Acc & P1

         ii)   result = Acc | P1

         iii)   result = Acc ^ P1

         iv)   result = ~ P1

     b)   Describe the function of the following pins of 89C51 microcontroller.

         i) $\overline{\text{EA}}$

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

         iii)   ALE

         iv)   RST

     c)   State the parameters of I^2C protocol. (Any four)

     d)   Draw a labelled diagram to interface LED to pin P2.1 of 89C51 microcontroller. Write a program to turn ON and OFF this LED after some delay.

Marks

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

a) Differentiate RTOS with desktop O.S. (any four points).

b) Develop on 89C51 C program to transfer the message "YES" serially at 9600 baud rate continuously. Use 8 bit data and 1 stop bit.

c) Differentiate between 8031, 8051 and 8751 based on the following parameters.

   i)   On chip program memory and data memory

   ii) Number of 16 bit timer / counters.

d) Explain the need of multitasking and intertask communication in real time operating system.

e) Draw the interfacing diagram of DC motor with Arduino board and describe the procedure of interfacing. (Using PWM)

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

a) Draw a diagram to interface stepper motor to 89C51 and develop a program in embedded 'C' to rotate the stepper motor in anticlockwise direction.

b) Develop 89C51 C program to toggle all the bits of port 0 continuously with 100 msec delay in between. Use timer 0, mode 1 to generate delay. The XTAL frequency is 11.0592 MHz calculate the value of the count which is to be loaded in times register.

c) State three features of SPI and Bluetooth wireless communication protocol.

Marks

6. **Attempt any <u>TWO</u> of the following :** 12

    a) Draw the interfacing diagram of ADC 0808 to 89C51 microcontroller and state the function of SOC, EOC and ALE pins of ADC 0808.

    b) State the interrupts of 89C51 microcontroller. Give their priority and vector address. Draw the format of IP register and describe the function of each bit.

    c) Describe the need of RTOS in embedded system. State any three features of RTOS.

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