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.

1. a) Attempt any THREE of the following: 12

   (i) State four differences between RISC and CISC architecture.

   (ii) List any four software development tools used in an embedded system and state the function of each.

   (iii) Draw the frame format of I\textsuperscript{2}C and explain each field in brief.

   (iv) Draw the interfacing diagram of 4 × 4 matrix keypad with 89C51 microcontroller.

b) Attempt any ONE of the following: 6

   (i) Draw block diagram of embedded system and describe any four hardware units of embedded system.

   (ii) List scheduling algorithms of RTOS. Describe concept of pre-emptive multitasking scheduling algorithm of RTOS with suitable diagram.
2. Attempt any **FOUR** of the following: 16
   a) Draw the format of TMOD. Describe the function of each bit.
   b) Write 89C51 ‘C’ program to toggle all the pins of part P2 continuously with 400 ms delay.
   c) Differentiate between synchronous communication and asynchronous communication (Any four points)
   d) Write a ‘C’ program to read the status of key connected to P1.3. If the key is pressed, turn on the LED connected to P3.5 for 20ms sec.
   e) Explain the concept of deadlock with suitable schematic.
   f) Describe the following characteristics of embedded system:
      (i) Processor power
      (ii) Memory
      (iii) Reliability
      (iv) Safety

3. Attempt any **FOUR** of the following: 16
   a) Draw the pinout of RS-232 (DB-9) connector and the interfacing diagram of RS232 with 89C51.
   b) Find the contents of port after execution of following code:
      (i) P2 = 0×74 >>3;
      (ii) P3 = 0×04 | 0×68;
   c) Explain inter-task communication with reference to RTOS.
   d) Define embedded system. List any two advantages and disadvantages of embedded system.
   e) Write a ‘C’ program to transfer the message “MSBTE” serially at 9600 baud rate continuously.
4. a) Attempt any THREE of the following: 12
   (i) Draw the format of SCON register and explain all the bits.
   (ii) List four features of each of the following
        (1) Bluetooth
        (2) Zigbee
   (iii) Classify an embedded system. Describe any two types.
   (iv) Differentiate RTOS with desktop OS (any four points)

b) Attempt any ONE of the following: 6
   (i) Write a ‘C’ program to generate a square wave of 100 Hz on P1.3. Also draw the output observed on P1.3.
   (ii) Draw the circuit diagram to interface LCD with 89C51. Write ‘C’ program to send letters ‘M’, ‘D’ and ‘E’ to the LCD display.

5. Attempt any FOUR of the following: 16
   a) State any four data types used in Embedded C, with their value range.
   b) List the serial and wireless communication protocols. And describe IEEE 802.11.
   c) Draw interfacing diagram of DACO808 with 89C51 microcontroller.
   d) State the methods of task synchronization. Describe Semaphore with suitable example.
   e) Differentiate between assembly language program with an embedded ‘C’ with respect to
      (i) Execution Time
      (ii) Time for coding
      (iii) Hex file size
      (iv) Debugging
   f) Draw labelled interfacing diagram of stepper motor with 89C51 microcontroller.
6. Attempt any FOUR of the following: 16

a) Define the terms:
   (i) In-curcuit Emulator
   (ii) Integrated Development Environment

b) Differentiate between CAN and I2C protocols with respect to
   (i) Data transfer rate
   (ii) No. of fields
   (iii) Addressing bit
   (iv) Application

c) Draw labelled interfacing diagram of ADC0808 with 89C51, show the handshaking signals clearly.

d) Draw the interfacing diagram of relay with 89C51.

e) Write Logical operators in ‘C’ for AND, OR, Ex-OR and NOT for 89C51 and state one example of each.