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

Marks

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

   (i) State the interrupts used in 89C51? Give their priorities and vector addresses.

   (ii) Write difference between synchronous and asynchronous data communication.

   (iii) List the software development tools in an embedded system and state the function of compiler and debugger.

   (iv) Draw interfacing diagram of $4 \times 4$ matrix keyboard with 89C51 micro controller (No program)
b) **Attempt any ONE of the following:**

(i) Describe the methods of task synchronization and explain any one in details.

(ii) Draw and explain different hardware units of an embedded system.

2. **Attempt any FOUR of the following:**

a) State any four advantages of an embedded systems.

b) Draw the format of TMOD SFR and write significance of each bit.

c) Draw the interfacing diagram of $16 \times 2$ LCD display with 89C51 and state the function of

(i) RS

(ii) EN

(iii) R/W

d) Write 89C51 ‘C’ language program to toggle all bits of port $P_2$ continuously with 500 ms delay.

e) Differentiate between CAN and $I^2C$ protocols with respect to

(i) Data transfer rate

(ii) Number of fields

(iii) Addressing bits

(iv) Application

f) Describe semaphore with suitable example.
3. **Attempt any FOUR of the following:**

a) Find the content of Accumulator after execution of the following code
   
   (i) \( \text{ACC} = 0 \times 94 \gg 5; \)
   
   (ii) \( \text{ACC} = 0 \times 5A \ll 2; \)

b) Write any four feature of RTOS.

c) Write 89C51 ‘C’ language program to rotate stepper motor by 180° in clockwise direction motor has step angle 1.8°. Use stepper motor of 4 step pulse sequence.

d) Write any four characteristics of an embedded system.

e) Write any four feature of USB.

4. a) **Attempt any THREE of the following:**

   (i) Explain \( I^2C \) protocols with suitable diagram.

   (ii) Differentiate between General purpose operating system and RTOS (any four points).

   (iii) Differentiate between RISC an CISC computer.

   (iv) Write the defination of an embedded system? How it is classified?

b) **Attempt any ONE of the following:**

   (i) Draw interfacing diagram of ADC 0808 with 89C51 micro controller and write ‘C’ language program to read data from ADC 0808.

   (ii) Write 89C51 ‘C’ program to transfer ‘YES’ serially at baud rate 9600 continuously Use 8 bit data and 1 stop bit. Assume crystal frequency 11.0592 MHz.
5. **Attempt any FOUR of the following:**

   a) Draw the pin out of RS232 and describe the function of TXD, RXD, DTE and DCE.

   b) Write ‘C’ language program to generate a triangular waveform of DAC 0808.

   c) Describe deadlock in RTOS with suitable example.

   d) Draw labelled interfacing diagram of DC Motor with 89C51 microcontroller.

   e) Write ‘C’ language program to mask the lower 4 bits of port P₀ and upper 4 bits of port P₂ using logical operator.

   f) Describe program downloading tools. ISP and IAP.

6. **Attempt any FOUR of the following:**

   a) Describe parallel protocols PCI, PCI-X.

   b) Draw labelled interfacing diagram of seven segment display with 89C51 microcontroller.

   c) State all logical operators used in ‘C’ and explain any one with example.

   d) Draw interfacing diagram of LED to port pin P₂.₄ of 89C51 write ‘C’ language program to turn ON and OFF LED after 20 ms delay.

   e) List Date types used in ‘C’ with their values.