Instruction: (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.

1. Attempt any FIVE of the following: [10]
   (a) Draw internal RAM organisation of 89C51 microcontroller. Explain register banks in it.
   (b) State the function of simulator, linker compiler and debugger.
   (c) Draw a labelled interfacing diagram of ADC 0808 with 8951 microcontroller.
   (d) Explain pre-emptive scheduling and round-robin scheduling algorithms in RTOS.
   (e) Define the terms: RISC and CISC
   (f) Illustrate any two data types used in C with their ranges.

2. Attempt any THREE of the following: [12]
   (a) A 230 V AC bulb is connected through a relay at P2.2. A light sensor is connected at P3.4. A light sensor produces logic high in dark condition. Write a 'C' program to switch 'ON' the bulb in 'DARK' condition and switch it OFF in 'LIGHT' condition.
   (b) Describe intertask communication in RTOS.
   (c) Write a C language program to toggle all bits of P0, P1, P2 and P3 continuously with certain delay.
   (d) Draw the 9 pin RS 232C connector and state the significance of DTR and DSR signals.
   (e) State any two applications for each of the following:
      (i) Small Scale Embedded System.
      (ii) Medium Scale Embedded System.

3. Attempt any THREE of the following: [12]
   (a) Write a 'C' program to toggle P2.1 continuously with 100 ms delay. (Use simple delay subroutine).
   (b) Compare desktop operating system with RTOS with any four points.
   (c) State any two advantages and disadvantages of embedded system.
   (d) Write a 'C' language program to rotate stepper motor by 90° clockwise. Assume step angle of 1.8° and 4 step sequence.

4. Attempt any THREE of the following: [12]
   (a) Draw format of TMOD register. Find the value of TMOD register to operate timer 0 in mode 1.
   (b) Write a 'C' program to generate a square wave of 5 kHz. (Operate timer 0 in mode 1).
   (c) Compare Zigbee and Bluetooth on the basis of following points:
      (i) Modulation Technique.
      (ii) Communication Range.
      (iii) Power Consumption.
      (iv) IEEE standard.
   (d) Draw the interfacing diagram of ADC with 89C51 and explain the function of following pins: SOC, EOC and OE.
5. Attempt any TWO of the following: [12]
   (a) Distinguish between synchronous and asynchronous communication with any four points.
   (b) State number of portlines required for a keyboard matrix having following keys:
       (i) 16    (ii) 256    (iii) 64    (iv) 144
   (c) Explain pre-emptive and round robin scheduling in RTOS.
       Write a C language program to generate square waveform of 5KHz on pin P1.5 of 89C51.

6. Attempt any TWO of the following: [12]
   (a) Draw pin diagram of DB9 connector, stating function of each pin.
   (b) Manipulate the following table for data types used in 'C' language.

<table>
<thead>
<tr>
<th>Data type</th>
<th>Bit size</th>
<th>Data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Unsigned char</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>(2) Signed int</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>(3) Sbit</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>(4) Sfr</td>
<td>?</td>
<td>?</td>
</tr>
</tbody>
</table>
   (c) Explain in detail the term deadlock and techniques to prevent it.
   (d) Explain in detail any six characteristics of Embedded System.