# 17658

**11920**

**3 Hours / 100 Marks**    Seat No.

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

(i)  Compare Microprocessor with Microcontroller on the basis of any four factors.

(ii)  State functions of Assembler and Emulator.

(iii)  Compare following type of communication:

(1)  Asynchronous serial and

(2)  Synchronous serial

(iv)  Sketch interfacing diagram to show interface between stepper motor and 89C51.

b) **Attempt any ONE of the following :**    **6**

(i)  Sketch basic block diagram of embedded system. State its any two advantages and two disadvantages.

(ii)  Explain the concept of 'Dead lock'. Why it occurs? How to avoid it?

**Marks**

**2.** **Attempt any <u>FOUR</u> of the following :** **16**

a) State type of SFR used to set priority and to enable or disable interrupt.

b) Write 89C51 'C' program to operate LED after fix interval.

c) Explain role of handshaking signal in RS232c transmitter and receiver.

d) Write a 'C' program to read the status of key connected to port 1 at P1.7. If the key is pressed then send FFh at P2, else send ooh at P2.

e) With suitable example explain semaphore in embedded system.

f) Compare with example hard and soft real time embedded system.

**3.** **Attempt any <u>FOUR</u> of the following :** **16**

a) Give one example of asynchronous communication and for that application Justify "Asynchronous communication is better than synchronous communication".

b) Write 'C' language program to read PO. Exchange it's nibble and send result at P1.

c) Explain the features of RTOS.

d) List out essential design specifications for following type of embedded system:

(i) Stand-alone system

(ii) Networked system

e) Write a 'C' program to read output of ADC. Sketch interfacing diagram showing 89C51 with ADC.

**4.** a) **Attempt any <u>THREE</u> of the following :** 12

   (i) List out architectural features of DSP processor. (any four features)

   (ii) Compare USB with Bluetooth protocol on the basis of any four factors.

   (iii) State the importance of following design specification in embedded system.

   (1) Memory

   (2) Reliability

   (3) Flexibility

   (4) Safety

   (iv) Explain any one scheduling algorithm used in RTOS.

   b) **Attempt any <u>ONE</u> of the following :** 6

   (i) Write 89C51 'C' program to transfer the message 'ESC' serially at fixed baud rate. Assume suitable baud rate, data size and no. of stop bits.

   (ii) Draw labelled circuit diagram to interface LCD with microcontroller 89C51. Describe functions of various pins of LCD.

**5.** **Attempt any <u>FOUR</u> of the following :** 16

   a) Write step by step process to develop and execute microcontroller program using Keil.

   b) List out features of 802.11 protocol.

   c) Draw labelled circuit diagram to interface 4 × 4 matrix keyboard with microcontroller 89C51.

   d) Explain inter-task communication feature of RTOS in embedded system.

   e) State role of In-circuit emulator and JTAG port in software development.

   f) Draw interfacing diagram of relay with 89C51.

**Marks**

**6.** **Attempt any FOUR of the following :** **16**

  a) List out features and state operating procedure of program downloading tool ISP.

  b) Compare $I^2C$ with CAN on the basis of four factors.

  c) Write a 'C' program to operate DC motor interfaced to 89C51.

  d) Sketch labelled diagram to interface DAC with 89C51 and write program to generate square wave signal.

  e) Write operator in 'C' for:

    (i) Addition

    (ii) Anding

    (iii) Multiplication

    (iv) NOT operation

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# 22532

**12223**

**3 Hours / 70 Marks**      Seat No. ⬚⬚⬚⬚⬚⬚⬚⬚

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*Instructions –*  (1) All Questions are *Compulsory.*

(2) Answer each next main Question on a new page.

(3) Illustrate your answer with neat sketches wherever necessary.

(4) Figures to the right indicate full marks.

(5) Assume suitable data, if necessary.

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**Marks**

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

a) List any four application's of Embedded system.

b) State any two characteristics of embedded systems.

c) List any four software development tools used in an embedded system.

d) Sketch and label the block diagram of embedded system.

e) State any four application's of bluetooth.

f) State the functions of following pins of LCD.

   i)    RS

   ii)   R/W

g) List any four function's of RTOS.

**Marks**

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

a)  Compare RISC and CISC processor's.

b)  Write 89C51 C program to toggle all the bit's of $P_0$, $P_1$ and $P_2$ continuously with a zooms delay using the sfr keyword to declare the port address.

c)  Compare between CAN and $I^2C$ protocols on following points:

   i)    Data transfer rate

   ii)   Number of fields

   iii)  Addressing bit

   iv)   Application

d)  Write 89C51 C program to rotate stepper motor by 90° Degree clockwise. Assume step angle is 1.8° degree and four step sequence.

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

a)  If the content of ACC = 0 × 04 and P1 = 0 × F3. State the result after execution of the following statement independently.

   i)    Result = ACC and $P_1$

   ii)   Result = ACC | $P_1$

   iii)  Result = ACC $l$ $P_1$

   iv)   Result = ~ $P_1$

b)  Sketch and label the pinout of RS232 and describe the function of DCE and DTE pins.

c)  Explain the concept of Deadlock with suitable schematic.

d)  Compare general purpose operating system and RTOS (four points).

**Marks**

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

a) Write a 89C51 C program to generate continuous square wave of 2 KHz on P1.5 using mode 1 of timer 0. The XTAL frequency is 11.0592 MHz.

b) State any four features of Bluetooth Technology.

c) Compare features of PIC and ARM microcontrollers (four points).

d) Compare assembly language and embedded C program with respect to :–

    i) Execution time

    ii) Time for coding

    iii) Hex file size

    iv) Debugging

e) Draw an interfacing diagram of DAC to 89C51 and write a C language program to generate square wave using DAC.

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

a) Write a 89C51 C program to display "WELCOME" on 16 × 2 LCD display.

b) Write a 89C51 C program to transfer the message "Exam" serially at baud rate 4800, 8 bit data, 1 stop bit.

c) Draw CAN message format and explain it. State any two application's of CAN BUS.

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

a) Write a 89C51 C program for 4 × 4 keyboard matrix.

b) Draw the interfacing diagram of seven segment LED display to 89C51 and write a 89C51 C program to display 0.9 continuously.

c) List any four characteristics of RTOS and explain the following functions of RTOS in brief :

    i) Scalability

    ii) Task management

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# 22532

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(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.

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**Marks**

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

a)   Classify embedded system.

b)   Define RISC and CISC.

c)   State any two features of IrDA.

d)   State any two data types used in C with their range.

e)   Define Reliability, Scalability related to RTOS.

f)   Draw the format of TMOD register.

g)   List various temperature sensors used in industry.

**Marks**

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

a) Compare Harvard and Von-Neumann architecture.

b) Write 89C51 C program to mask the lower 4 bits of P2 and upper 4 bits of P0. using logical operator.

c) Draw and explain CAN bus with frame format.

d) State features of 89C51 microcontroller.

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

a) Draw labelled diagram to interface 16 × 2 LCD with 89C51. State function of pins

   i)   RS

   ii)  RIW

   iii) EN

b) Differentiate between general purpose operating system (GPOS) and real time operating system (RTOS).

c) Draw the pin out of RS 232 and describe function of TXD, RXD, DTE and DCE pins.

d) Write 89C51 C program for multiplication of two 8 bit numbers.

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

a) Write C program to send character 'ESY' serially at 9600 baud rate continuously. Assume crystal frequency 11.0592 MHz.

b) Draw and explain USB protocol.

c) Draw interfacing diagram of 3 × 3 matrix keyboard with 89C51.

d) State any four features of zigbee.

e) Draw interfacing diagram of ADC to 89C51 and explain function of following pins SOC, EOC, and OE.

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

a)   Explain watchdog timer and semaphore in detail.

b)   Draw the interfacing diagram for temperature measurement using LM35, ADC 0808 with microcontroller 89C51.

c)   Write a C program to toggle all bits of port 1 continuously with 60 ms delay in between. Use timer 0 in mode 1 to generate the delay.

     The XTAL frequency is 11.0592 MHz.

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

a)   Explain pre-emptive and round robin scheduling algorithm in RTOS.

b)   Draw the block diagram of embedded system and explain with hardware component.

c)   Draw interfacing diagram of DAC to 89C51 and write a 'C' language program to generate sawtooth wave.

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# 22532

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**Marks**

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

a)  List out four types of embedded systems.

b)  State four advantages of embedded system.

c)  State the use of MAX 232 in communication.

d)  Illustrate any two logical operators used in C with their examples.

e)  State two examples of RTOS.

f)  Develop a 'C' program to transfer the data from port P0 to port Pl.

g)  Sketch pin-out diagram of LM35 and label it's pin.

**Marks**

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

   a) Compare features of PIC and AVR microcontrollers (any four)

   b) Write a C language program to operate port 0 and port 2 as output port and port 1 and port 3 as input port.

   c) Compare synchronous and asynchronous communication. (any four points)

   d) Explain the need to consider following factors in design matrix of embedded system:

      (i) Processor

      (ii) Memory

      (iii) Power

      (iv) Non - recurring engineering cost.

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

   a) Sketch circuit diagram showing interfacing of one 7-segment display to 89C51. Write a 'C' program to display 'F' and 'Fi' alternately.

   b) Explain the term 'Deadlock'. State reason of occurance.

   c) Explain the process of handshaking in RS232 standard based communication.

   d) Write a 'C' language program to mask the upper four bits of the data given in port 0 and write the answer in port 1.

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

   a) Write 'C' program to generate delay of 50 msec for microcontroller 89C51 with crystal frequency of 11.0592 MHz.

   b) List out eight features of USB.

   c) Draw the interfacing diagram of ADC with 89C51 and state the function of SOC, EOC and OE pins.

   d) Explain 'CAN' bus protocol and list out it's two applications.

   e) Sketch interfacing diagram to interface LCD display with 89C51.

**Marks**

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

    a) Explain resource allocation and interrupt handling function of RTOS.

    b) Write a 'C' language program for 89C51 to generate triangular waveform.

    c) Write a 'C' language program for serial communication to transfer letter 'M' serially at 9600 baud continuously.

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

    a) List out characteristics of RTOS and explain any four characteristics

    b) Compare :

       (i) RISC with CISC processor

       (ii) Harward with Von Neuman architecture.

    c) Explain with sketch interfacing of stepper motor with 89C51. Write 'C' language program to rotate the motor clockwise.

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# 17658

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(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.

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**Marks**

1.  a)  **Attempt any <u>THREE</u> of the following:**     **12**

(i)   Draw internal RAM organisation of 89C51 microcontroller. Explain register banks in it.

(ii)  State the function of simulator, linker compiler and debugger.

(iii) Describe parallel communication protocols.

(iv)  Draw a labelled interfacing diagram of ADC 0808 with 8951 microcontroller.

b)  **Attempt any <u>ONE</u> of the following:**     **6**

(i)   Classify embedded system. Describe any two of them in short.

(ii)  Explain pre-emptive scheduling and round-robin scheduling algorithms in RTOS.

Marks

**2.** **Attempt any FOUR of the following:** 16

a) Compare RISC and CISC architectures with any four points.

b) Explain the use of assembly language in C language with suitable example.

c) Draw a labelled interconnection diagram between RS232 and 8951 microcontroller.

d) 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.

e) Describe intertask communication in RTOS.

f) Draw and explain block diagram of embedded system.

**3.** **Attempt any FOUR of the following:** 16

a) List wireless communication protocols and state four features of zigbee protocol.

b) Write a 'C' program to toggle P2.1 continuously with 100 ms delay. (Use simple delay subroutine).

c) Compare desktop operating system with RTOS with any four points.

d) State any two advantages and disadvantages of embedded system.

e) Draw a labelled interfacing diagram of DAC 0808 with 8951 microcontroller. Also write a 'C' program to generate triangular waveform using DAC.

**Marks**

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

    (i)    Draw format of TMOD register. Find the value of TMOD register to operate timer 0 in mode 1.

    (ii)   Explain CAN Bus protocol with the frame structure.

    (iii)  State any eight design metrics of embedded system.

    (iv)  Explain the concept of deadlock with suitable example.

  b) **Attempt any ONE of the following:**       **6**

    (i)    Write a 'C' program to generate a square wave of 5 kHz. (Operate timer 0 in mode 1).

    (ii)   Draw labelled interfacing diagram of stepper motor with 8951. Write a 'C' program to rotate it in counterclockwise direction.

**5.**   **Attempt any FOUR of the following:**       **16**

  a)  State 'C' language logical operators for AND, OR, NOT and EX-OR operation. Give one example of each.

  b)  Distinguish between synchronous and asynchronous communication with any four points.

  c)  State number of portlines required for a keyboard matrix having following keys:

    (i)    16

    (ii)   256

    (iii)  64

    (iv)  144

  d)  State four key specifications of RTOS.

  e)  Describe in-circuit emulator.

  f)  Draw labeled interfacing diagram of $4 \times 4$ matrix keypad with 8951.

**Marks**

**6.** **Attempt any FOUR of the following:** **16**

a) Distinguish between assembly language and C language with reference to:

    (i) Ease of programming

    (ii) Memory requirement

    (iii) Coding time

    (iv) Execution time

b) Draw pin diagram of DB9 connector, stating function of each pin.

c) Draw labelled interfacing diagram of $16 \times 2$ LCD with 8951 and state function of RS and R/W pin.

d) A key is connected at P3.2 and 8 LEDs are connected to $P_1$ of 8951. Write a 'C' program to display 0 to 255 in binary on LEDs, when a key is pressed.

e) Manipulate the following table for data types used in 'C' language.

| Sr. No. | Data type | Bit size | Data range |
|---------|-----------|----------|------------|
| 1. | Unsigned char | ? | ? |
| 2. | Signed int | ? | ? |
| 3. | Sbit | ? | ? |
| 4. | Sfr | ? | ? |

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# 17658

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**Marks**

1.  a)  **Attempt any <u>THREE</u> of the following:**                    **12**

(i)  State and describe any four design metrics of embedded system.

(ii)  Draw interfacing diagram of 4*4 matrix keyboard with 89c51 μc.

(iii)  Describe the function of following software development tools for 89c51 microcontroller.

1)  Compiler

2)  Linker

3)  Debugger

4)  Crosscompiler

(iv)  Compare Von Neumann and Hardware architecture.

**Marks**

b) **Attempt any <u>ONE</u> of the following:**      **6**

    (i)    List any six data types in Embedded 'C' with their size in bits and data range.

    (ii)    Draw interfacing diagram of ADC with 89c51 microcontroller and explain function of following pins of ADC.

         1)   SOC,

         2)   EOC,

         3)   OE

    (iii)   State different scheduling algorithms of RTOS and describe Round Robin scheduling algorithm.

**2.**      **Attempt any <u>FOUR</u> of the following:**      **16**

    a)   Compare synchronous and asynchronous type of serial communication.

    b)   State any two features of IDE and ICE.

    c)   State any two advantages and two applications of Embedded system.

    d)   Draw and describe architecture of RTOS.

    e)   Draw interfacing diagram of LCD with microcontroller 89c51.

**3.**      **Attempt any <u>TWO</u> of the following:**      **16**

    a)   Draw interfacing diagram of DAC with 89c51 μc and write 'c' language program to generate triangular waveform using DAC.

    b)   Write 'C' language program to generate square wave of frequency 5 KHz on p3.5 pin of μc 89c51. Use timer 1, mode 1 to generate delay. Assume XTAL = 11.0592 MHz.

    c)   Write 'C' language program to rotate stepper motor in clockwise direction continuously. Draw interfacing diagram of stepper motor with 89c51 μc.

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

    (i) Compare bluetooth and zigbee wireless communication protocols.

    (ii) State any four features of USB serial communication protocol.

    (iii) Draw 8 bit format of TMODSFR and explain how modes of timer can be selected using TMOD.

    (iv) Describe the function of following:

        1) Simulator

        2) Emulator

  b) **Attempt any ONE of the following:** 6

    (i) Write 'C' language program to toggle bit P1.5 of part 1 continuously after 50 ms delay. Generate delay using for loops.

    (ii) State classification of Embedded system and describe any two types with example.

**5.** **Attempt any FOUR of the following:** 16

  a) Compare RISC and CISC.

  b) Write 'C' language program to check bit P1.2. If it is high send 55 H to PO, otherwise send AAH to P2.

  c) Describe following wireless communication protocols:

    (i) IrDA,

    (ii) WiFi

  d) Describe the features of I2C serial communication protocol.

  e) Draw interfacing diagram of 7 segment LED display with microcontroller 8051.

**Marks**

**6.** **Attempt any FOUR of the following:** **16**

   a) Draw block diagram of Embedded system.

   b) Describe the function of CAN bus protocol.

   c) State any four specifications of RTOS.

   d) Differentiate between general purpose operating system (GPOS) and real time operating system (RTOS).

   e) Describe hard and soft real time operating system with example.

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# 17658

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(4) Figures to the right indicate full marks.

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(8) Preferably, write the answers in sequential order.

**Marks**

**1.**   a)   **Attempt any <u>THREE</u> of the following:**        **12**

(i)   List various SFRs needed for serial communication using microcontroller 89C51. Also list various standard baud rates for serial communication.

(ii)   List various software development tools available in IDE. Explain any one in brief.

(iii)   List the features of 12C bus.

(iv)   Draw labelled diagram to interface 16 × 2 LCD with 89C51. State the function of pins:

1)   RS

2)   R/W

3)   EN

**Marks**

b) Attempt any <u>ONE</u> of the following:                    **6**

   (i)   State various types of embedded systems. Explain any two in brief. State four applications of embedded systems.

   (ii)  State various task scheduling algorithms in RTOS. Explain any one in brief.

**2.**      Attempt any <u>FOUR</u> of the following:                **16**

a) Compare RISC and CISC architecture.

b) Write 'C' program for 89C51 to read data from port P1 and P2. Compare the data and send the bigger data on port 3 continuously.

c) Distinguish between CAN and 12C bus protocols with respect to:

   (i)   Data transfer rate

   (ii)  Number of fields

   (iii) Addressing bit

   (iv)  Applications

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

e) Compare general purpose operating system and RTOS.

f) Explain any four characteristics of embedded systems.

**3.**      Attempt any <u>FOUR</u> of the following:                **16**

a) Draw the pinout diagram of RS-232 (DB9). State the function of all pins.

b) Write 89C51 'C' program to receive data serially from RX pin and send the data on port 1 continuously. Assume baud rate to be 9600 and crystal frequency as 11.0592 MHz.

c) What is deadlock in an embedded system? State the schemes to avoid deadlock.

d) Draw the block diagram of embedded system. Explain any one subsystem.

e) Draw labelled diagram to interface DC motor with 89C51. Write 'C' program to rotate the motor continuously.

**Marks**

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

   (i) Explain DSP in brief. State any two applications.

   (ii) Compare synchronous and asynchronous serial communication.

   (iii) List advantages and disadvantages of embedded system.

   (iv) Explain inter process communication in brief. State various inter process communication methods.

   b) **Attempt any ONE of the following:** 6

   (i) Write 89C51 'C' language program to generate square wave of 10 KHz on pin P2-7 using timer 0. Assume crystal frequency as 12 MHz.

   (ii) Draw the diagram to interface DAC 0808 to microcontroller 89C51. Write 'C' language program to generate saw tooth wave continuously.

**5.** **Attempt any FOUR of the following:** 16

   a) If the content of ACC = 0 × 02 and P1 = 0 × 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) State the features of Zigbee. State four applications.

   c) Draw labelled diagram to interface ADC 0808 with microcontroller 89C51.

   d) State and explain any four key specifications of RTOS.

   e) Compare assembly language program and embedded 'C' programming (any four points).

   f) Write 'C' program to rotate the stepper motor by two complete rotations and then stop. Assume step angle as 1.8°.

**Marks**

**6.**     **Attempt any <u>FOUR</u> of the following:**                      **16**

   a)  Explain JTAG in brief.

   b)  Compare Wi-fi (IEEE 802.11) with Bluetooth.

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

   d)  Draw the diagram to interface LED to pin P1.7 of 89C51. Write 'C' program to blink the LED.

   e)  List various data types in embedded C with their data range.

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**15116**

**3 Hours / 100 Marks**    Seat No.

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**Marks**

**1.**  a)  **Attempt any <u>THREE</u> of the following:**    **12**

(i) List ports of 89C51 microcontroller and list alternative functions of port-3 pins.

(ii) List any four different hardware units in embedded system. Write function of any two of them.

(iii) Draw and explain CAN bus protocol.

(iv) Draw the pin diagram of 14 pin LCD display. State any function of each pin.

b)  **Attempt any <u>ONE</u> of the following:**    **6**

(i) Explain the classification of an embedded system.

(ii) State the scheduling algorithms of RTOS and describe the concept of round robin scheduling.

**Marks**

**2. Attempt any FOUR of the following:** 16

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

b) Write the steps for programming 8051 micorcontroller to receive data serially.

c) Draw the pin-out of RS232C and describe the function of TXD, RXD, DTE and DCE.

d) Draw the interfacing diagram of 4 × 4 matrix keyboard with 89C51 microcontroller.

e) State the methods of task synchronization and explain any one in detail.

f) Describe any four applications of an embedded system.

**3. Attempt any FOUR of the following:** 16

a) Compare between CAN and I2C protocols on following points:

(i) Data transfer rate

(ii) Number of fields

(iii) Addressing bit

(iv) Application

b) What are different logical operators in 'C' for 89C51? Give one example each (any four).

c) State any four functions of RTOS.

d) Classify an embedded system. Describe any two points.

e) Draw labelled interfacing diagram to interface DC motor with 8051 microcontroller.

**Marks**

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

    (i)    List the interrupts of 89C51 microcontroller with their vector locations and order of priority.

    (ii)   State any four features of Bluetooth Technology.

    (iii)  Describe any four specifications of RTOS. Give any four examples of RTOS.

    (iv)  Explain the meaning of following terms with reference to embedded system:

        1)   Inter task communication

        2)   Multi-tasking

**b) Attempt any ONE of the following:**                         **6**

    (i)    Write 89C51 'C' program to transfer the message "INDIA", serially at 9600 band rate continuously. Use 8 bit data and 1 stop bit.

    (ii)   Draw the interfacing diagram of DAC with 89C51 micorcontroller. Write a program in 'C' language to generate positive ramp voltage.

**5.**      **Attempt any FOUR of the following:**          **16**

    a)  Describe how assembly language instructions can be included in 89C51 'C' program.

    b)  Differentiate synchronous and asynchronous communication (any four points).

    c)  Draw labelled interface diagram to interface LED to P2.1 of 89C51. Write 89C51 'C' program turn ON and OFF this LED after some delay.

    d)  Explain the concept of starvation and deadlock in RTOS.

    e)  Describe the program down-loading tools ISP/IAP.

    f)  Draw the interfacing diagram of ADC with 8051 microcontroller.

**Marks**

**6.**  **Attempt any <u>FOUR</u> of the following:** 16

a)  Compare between assembly language program with an embedded 'C' with reference to following points:

(i)  Execution time

(ii)  Time for coding

(iii)  Hex file size

(iv)  Debugging

b)  Draw and explain USB protocol.

c)  Draw the interfacing diagram of stepper motor with 8051 microcontroller.

d)  Draw the interfacing diagram of LCD display with 8051 microcontroller.

e)  Write 89C51 'C' program to toggle bits of port $P\phi$ continuously with a 200 millisecond delay.

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**15162**

**3 Hours / 100 Marks**   Seat No. ☐☐☐☐☐☐☐☐

*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.

**Marks**

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 $I^2C$ and explain each field in brief.

   (iv) Draw the interfacing diagram of $4 \times 4$ 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.

**Marks**

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 20m 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)    $P2 = 0 \times 74 >> 3$;

      (ii)   $P3 = 0 \times 04 \mid 0 \times 68$;

   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 <u>THREE</u> 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) Zighee

    (iii)  Classify an embedded system. Describe any two types.

    (iv)  Differentiate RTOS with desktop OS (any four points)

b) **Attempt any <u>ONE</u> 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 <u>FOUR</u> 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 inferfacing diagram of stepper motor with 89C51 microcontroller.

**Marks**

**6.** **Attempt any <u>FOUR</u> of the following:** **16**

a) Define the terms :

   (i)   In-curcuit Emulator

   (ii)  Integrated Development Environment

b) Differentiate between CAN and $I^2C$ 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.

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# 17658

*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.

(7) Write the answers in sequential order.

**Marks**

**1.** **Attempt any FIVE of the following:** **20**

a) Draw the architecture of 89CSI Microcontroller.

b) Write C language program to toggle all bits of P0, P1, P2 and P3 ports continuously with certain delay.

c) Differentiate between synchronous and asynchronous serial communication (any four points).

d) Draw the interfacing of 8 × 8 matrix keyboard with 89C51 microcontroller.

e) Write C language program to generate a triangular wave by using DAC0808.

f) State any four design metrics of an embedded system.

g) With help of neat diagram describe binary semaphore.

[ 2 ]

**2.** **Attempt any FOUR of the following:** 16

a) Differentiate between hardvard and Von Neumann architecture with suitable diagram (any four points)

b) Draw the pin out of RS232 and describe the function DCE and DTE pins.

c) Write a language program to read P2 and P3. Shift the bits of P2 to right by two bits and P3 to left by four bits. Store the content of P2 to P0 and P3 to P1.

d) Write C language program to rotate stepper motor by 90 degree clockwise. Assume step angle is 1.8 degree and 4 step sequence.

e) What is embedded system? Draw the block diagram of an embedded system.

f) What is inter task communication? Describe the different methods of inter task communication.

**3.** **Attempt any FOUR of the following:** 16

a) Describe the following terms:

(i) Cross complier

(ii) Emulator

(iii) Debugger

(iv) In-circuit Emulator

b) Write C language program to read P0 and P1. Add the content of P0 and P1 and store the result to P2.

c) State any two important features of following protocols.

(i) IrDA

(ii) Bluetooth

(iii) Zigbee

(iv) IEEE 802.11

d) Draw the interfacing of relay with 89C51 microcontroller. Write C language program to make relay ON/OFF after certain delay.

e) List the classification of an embedded system and describe any two embedded system in brief.

f) Differentiate between desktop OS and RTOS (any four point)

**4.** **Attempt any FOUR of the following:** **16**

a) Describe DSP and multicore processor in brief.

b) Write C language program to read P1 and store the one's complement of P1 to P2

c) Sate any two advantages of $I^2C$ and USB.

d) Draw the interfacing of DC motor with 89C51 microcontroller. Write C language program to rotate DC motor clockwise and anticlockwise.

e) State any two advantages and two applications of an embedded system.

f) List the scheduling algorithm of RTOS. Describe any one scheduling algorithm in brief.

**5.** **Attempt any FOUR of the following:** **16**

a) Differentiate between assembly language and embedded C (any four points)

b) Write C language program to transfer 10 bytes from array A to array B.

c) Draw the interfacing of LCD display to 89C51 microcontroller and describe the function of RS and RW pins.

d) Draw the interfacing of ADC 0808 with 89C51 microcontroller.

e) State the meaning of following terms:

   (i) multitasking

   (ii) Shard Data Problem

f) Draw and describe CAN bus protocol.

**Marks**

**6.** **Attempt any <u>FOUR</u> of the following:** **16**

a) What is meant by deadlock? Describe any three methods to prevent the deadlock.

b) Draw the interfacing of DAC 0808 with 89C51 microcontroller.

c) Describe the parallel protocols PCI and PCI-X.

d) Write C language program to generate a square wave of 2 KHz frequency on P1.1 pin by using timer 0 and mode 1. Assume XTAL frequency is 11.0592 MHz.

e) Draw the interfacing of key and LED to 89C51 microcontroller pins P1.0 and P2.0 respectively. Write C language program to read the status of key and display it on LED.
(Key open = LED OFF and key closed = LED ON)

f) Write C language program to transfer the message "MSBTE" serially at 9600 baud rate, 8 bit data and 1 stop bit.

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# 17658

*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 <u>THREE</u> 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 <u>ONE</u> of the following:**      **6**

    (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 <u>FOUR</u> of the following:**      **16**

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 <u>FOUR</u> of the following:** 16

  a) Find the content of Accumulator after execution of the following code

  (i) ACC = $0 \times 94 >> 5$;

  (ii) ACC = $0 \times 5A << 2$;

  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 <u>THREE</u> of the following:** 12

  (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 <u>ONE</u> of the following:** 6

  (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.

**Marks**

**5. Attempt any <u>FOUR</u> of the following:**     **16**

  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 $P_0$ and upper 4 bits of port $P_2$ using logical operator.

  f) Describe program downloading tools. ISP and IAP.

**6. Attempt any <u>FOUR</u> of the following:**     **16**

  a) Describe parallel protocols PCI, PCI-X.

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

  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.

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# 17658

*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 <u>THREE</u> 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 × 4 matrix keyboard with 89C51 micro controller (No program)

**Marks**

b) **Attempt any <u>ONE</u> of the following:**      **6**

   (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 <u>FOUR</u> of the following:**      **16**

  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 <u>FOUR</u> of the following:** 16

   a) Find the content of Accumulator after execution of the following code

     (i) ACC = 0 × 94 >> 5;

     (ii) ACC = 0 × 5A << 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 <u>THREE</u> of the following:** 12

     (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 <u>ONE</u> of the following:** 6

     (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.

**Marks**

**5.** **Attempt any <u>FOUR</u> of the following:** **16**

    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 $P_0$ and upper 4 bits of port $P_2$ using logical operator.

    f) Describe program downloading tools. ISP and IAP.

**6.** **Attempt any <u>FOUR</u> of the following:** **16**

    a) Describe parallel protocols PCI, PCI-X.

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

    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.

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**21718**

**3 Hours / 100 Marks**   Seat No.

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

   (i) Draw internal RAM organisation of 89C51 microcontroller. Explain register banks in it.

   (ii) State the function of simulator, linker compiler and debugger.

   (iii) Describe parallel communication protocols.

   (iv) Draw a labelled interfacing diagram of ADC 0808 with 8951 microcontroller.

   b) **Attempt any ONE of the following:**   6

   (i) Classify embedded system. Describe any two of them in short.

   (ii) Explain pre-emptive scheduling and round-robin scheduling algorithms in RTOS.

**2.** **Attempt any FOUR of the following:** **16**

a) Compare RISC and CISC architectures with any four points.

b) Explain the use of assembly language in C language with suitable example.

c) Draw a labelled interconnection diagram between RS232 and 8951 microcontroller.

d) 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.

e) Describe intertask communication in RTOS.

f) Draw and explain block diagram of embedded system.

**3.** **Attempt any FOUR of the following:** **16**

a) List wireless communication protocols and state four features of zigbee protocol.

b) Write a 'C' program to toggle P2.1 continuously with 100 ms delay. (Use simple delay subroutine).

c) Compare desktop operating system with RTOS with any four points.

d) State any two advantages and disadvantages of embedded system.

e) Draw a labelled interfacing diagram of DAC 0808 with 8951 microcontroller. Also write a 'C' program to generate triangular waveform using DAC.

**Marks**

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

    (i) Draw format of TMOD register. Find the value of TMOD register to operate timer 0 in mode 1.

    (ii) Explain CAN Bus protocol with the frame structure.

    (iii) State any eight design metrics of embedded system.

    (iv) Explain the concept of deadlock with suitable example.

  b) **Attempt any ONE of the following:** 6

    (i) Write a 'C' program to generate a square wave of 5 kHz. (Operate timer 0 in mode 1).

    (ii) Draw labelled interfacing diagram of stepper motor with 8951. Write a 'C' program to rotate it in counterclockwise direction.

**5.** **Attempt any FOUR of the following:** 16

  a) State 'C' language logical operators for AND, OR, NOT and EX-OR operation. Give one example of each.

  b) Distinguish between synchronous and asynchronous communication with any four points.

  c) State number of portlines required for a keyboard matrix having following keys:

    (i) 16

    (ii) 256

    (iii) 64

    (iv) 144

  d) State four key specifications of RTOS.

  e) Describe in-circuit emulator.

  f) Draw labeled interfacing diagram of $4 \times 4$ matrix keypad with 8951.

**Marks**

**6.** **Attempt any FOUR of the following:** 16

a) Distinguish between assembly language and C language with reference to:

    (i)   Ease of programming

    (ii)  Memory requirement

    (iii) Coding time

    (iv) Execution time

b) Draw pin diagram of DB9 connector, stating function of each pin.

c) Draw labelled interfacing diagram of $16 \times 2$ LCD with 8951 and state function of RS and R/W pin.

d) A key is connected at P3.2 and 8 LEDs are connected to $P_1$ of 8951. Write a 'C' program to display 0 to 255 in binary on LEDs, when a key is pressed.

e) Manipulate the following table for data types used in 'C' language.

| Sr. No. | Data type | Bit size | Data range |
|---------|-----------|----------|------------|
| 1. | Unsigned char | ? | ? |
| 2. | Signed int | ? | ? |
| 3. | Sbit | ? | ? |
| 4. | Sfr | ? | ? |

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# 17658

*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 <u>THREE</u> of the following:**                              **12**

(i)  List ports of 89C51 and alternate pin functions of port 3.

(ii)  List various software development tools available in IDE. Explain any one in brief.

(iii)  Draw and explain CAN bus protocol.

(iv)  Draw labeled diagram to interface 16x2 LCD with 89C51. State the function of pins.

1) RS

2) R/W

3) EN

**Marks**

b) **Attempt any ONE of the following:**     **6**

    (i)    State various types of Embedded system. Explain any one in brief. State any four applications of embedded system.

    (ii)    State the scheduling algorithms of RTOS and describe the concept of round robin scheduling.

2.      **Attempt any FOUR of the following:**     **16**

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

b)    Write C program for 89C51 to read data from port P1 and P2. Compare the data and send bigger data on port 3.

c)    Draw the pin out of RS 232 and describe the function of TXD, RXD, DTE and DCE Pins.

d)    Draw the interfacing diagram of $4 \times 4$ matrix keyboard with 89C51 microcontroller.

e)    Compare general purpose operating system and RTOS.

f)    State any four design metrics of an embedded system.

3.      **Attempt any FOUR of the following:**     **16**

a)    Compare between CAN and I2C protocols on the basis of following points:

    (i)    Data transfer

    (ii)    Number of field

    (iii)    Addressing bit

    (iv)    Application

b)    If the content of ACC $= 0 \times 06$ and P1 $= 0 \times D2$. State the result after execution of following statements independently:

    (i)    result = ACC and P1

    (ii)    result = ACC : P1

    (iii)    result = ACC ^ P1

    (iv)    result = ~ P1

c) State the methods of task synchronization. Describe semaphore with suitable example.

d) List advantages and disadvantages of embedded system.

e) Draw labeled interfacing diagram to interface DC motor with micro controller.

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

    (i) List the interrupts of 89C51 microcontroller with their vector locations and order of priority.

    (ii) State any four features of Bluetooth Technology.

    (iii) Explain the meaning of Deadlock and starvation with reference to embedded system.

    (iv) State any four specifications of RTOS. Give any four examples of RTOS.

b) **Attempt any ONE of the following:** 6

    (i) Write 89C51 C language program to generate square wave of 10 KHz on pin P2.7 using timer O. Assume crystal frequency as 12 MHz.

    (ii) Draw the interfacing diagram of DAC with 89C51 micro controller. Write a program in "C" language to generate triangular wave.

**5.** **Attempt any FOUR of the following:** 16

a) Explain JTAG in brief.

b) Compare synchronous and asynchronous communication. (any four points)

c) Draw labeled diagram to interface LED to P2.1 of 89C51. Write a language program to turn on and off this LED after some delay.

d) Explain inter process communication in brief. State various inter process communication methods.

e) Describe the program downloading tool ISP/IAP.

f) Draw the interfacing diagram of ADC with microcontroller.

**Marks**

**6.** **Attempt any FOUR of the following:** **16**

a) Compare between assembly language program with an embedded C with reference to following points:

(i) Execution time

(ii) Time for loading

(iii) Hex file size

(iv) Debugging

b) Draw and explain USB protocol.

c) Draw the interfacing diagram of stepper motor with microcontroller.

d) Draw the interfacing of relay with 89C51 microcontroller. Write C language program to make relay on-off after certain delay.

e) Write 89C51 C program to toggle all bits of part Po continuously with a 200 millisecond delay.

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