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**18EE52**

### Fifth Semester B.E. Degree Examination, Dec.2024/Jan.2025
## Microcontrollers

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

1  a. Draw the programming model of 8051 microcontroller and explain the following blocks:
   - (i) Program counter
   - (ii) Stack pointer.
   - (iii) Accumulator
   - (iv) Register B. **(08 Marks)**
   b. Explain the bits of program status word (PSW) register. **(06 Marks)**
   c. What is the status of carry flag, auxiliary carry flag and parity flag after adding :
   - (i) 96 H and 99 H
   - (ii) 64 H and 46 H **(06 Marks)**

### OR

2  a. Explain the role of EA pin and P0 and P2 ports in providing addresses. **(06 Marks)**
   b. Explain the following addressing modes :
   - (i) Immediate addressing mode.
   - (ii) Register indirect addressing mode. **(06 Marks)**
   c. What is memory address decoding? Explain the different methods. Design interfacing of $4K \times 8$ RAM using logic gates address decoder. Assume that address range is 8000 H to 8FFFH. **(08 Marks)**

### Module-2

3  a. Explain the working of following instructions :
   - (i) JZ
   - (ii) LJMP
   - (iii) SJMP **(06 Marks)**
   b. Write a program to perform the following :
   - (i) Keep monitoring pin P1.2 until it becomes high.
   - (ii) When P1.2 becomes high, read in the data from port $P_2$.
   - (iii) Send a high to low pulse on P1.3 to indicate that data has been received. **(06 Marks)**
   c. Explain the working of DAA instruction. 6 BCD numbers are stored in RAM locations starting at 80 H. Write a program to find sum of all numbers and result showed be in BCD. Assume that data is 10, 20, 30, 40, 50 and 60. Save the sum in register R5 and carry in register R6. Draw the flow chart also. **(08 Marks)**

### OR

4  a. Explain the working of following instructions :
   - (i) MUL AB
   - (ii) DIV AB. **(06 Marks)**
   b. Write a program to count number of 1's and 0's in a 8-bit number. Let the data be 67 H save the data in register R1, number of 1's in regiser R2 and number of 0's in register R3. Draw the flow chart also. **(08 Marks)**
   c. Let the accumulator A has packed BCD data. Write a program to convert packed BCD to two ASCII numbers and place them in registers R2 and R6. Assume data in accumulator A = 49H. **(06 Marks)**

## Module-3

5  a. Compare 8051 'C' programming with assembly language programming. **(05 Marks)**

   b. Write 8051 'C' program to toggle only bit P2.6 continuously. **(05 Marks)**

   c. Write an 8051 'C' program to get bit P1.2 and send it to polt P2.3 after inverting it.
   **(05 Marks)**

   d. Write a 'C' program to send out the value 33H serially one bit at a time through the port P1.5. The MSB should go out first. **(05 Marks)**

### OR

6  a. Explain the bit status of TMOD and TCON special function registers. **(10 Marks)**

   b. Write 8051 assembly language program to generate square wave of ON time 3 ms and OFF time of 10 ms on all pins of port 1. Assume crystal frequency of 11.0592 MHz. Show THO and TLO calculation for ON and OFF time. Use times 0 in mode – 1. **(10 Marks)**

## Module-4

7  a. State the programming steps to transfer the data serially in 8051 microcontroller. What is the importance of TI flag? **(07 Marks)**

   b. Write 8051 'C" program to transfer the message "VTU" serially at 9600 baud, 8 – bit data, 1 start and 1 stop bit. Do it continuously. **(07 Marks)**

   c. If the crystal frequency is 22 MHz, what is the baud rate if
      i)  $TH1 = -3$
      ii) $TH1 = -12$
      With SMOD = 0 and SMOD = 1. **(06 Marks)**

### OR

8  a. Compare interrupts vs polling. **(05 Marks)**

   b. Explain the bit status of IP register. **(05 Marks)**

   c. Write a program to generate two square waves, one of 5 KHz frequency at pin P1.3 and another of frequency of 25 KHz at P2.3. Assume XTAL = 22 MHz. Use timer-0 and timer-1 in mode – 2. Show TMOD, THO and TH1 and IE calculations. **(10 Marks)**

## Module-5

9  a. Explain the interfacing circuit of LCD with 8051 μc. Write assembly program for sending commands and data to LCD with a time delay. **(10 Marks)**

   b. Explain the internal architecture of serial ADC MAX1112. Draw the MAX1112 control byte also. **(10 Marks)**

### OR

10 a. Write a program to rotate stepper motor 64° in clockwise direction. The motor has a step angle of 2°. Show the calculations. **(05 Marks)**

   b. Draw the interfacing circuit of DC motor with opto isolator. A switch SW is connected to pin 3.2 which is INTO pin. Write a program :
      (i)  Normally motor runs with 33% duty cycle
      (ii) When INTO is activated, the motor runs with 100% duty cycle for a short duration.
      **(10 Marks)**

   c. Explain the role of electromechanical relays in microcontroller. **(05 Marks)**

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