

# MICROCONTROLLER VTU PAPER, DEC 2018/JAN 2019

## Module 1

1. a. Draw the programming model of 8051 microcontroller. Explain the following:

(i) Accumulator, Register B and CPU Registers.

(ii) Program Controller, Stack and Stack Pointer.

b. After adding the following data, show the states of CY, AC and P flags:

(i) 55h and AAh

(ii) 12h and 62h

### [Solution to Question 1](#)

2. a. Explain the internal RAM organization of 8051 with suitable diagrams.

b. How many address lines are required for accessing the data in the following memory ICs, while data is organized as bytes:

(i) 512 bytes RAM

(ii) 8K RAM

c. Explain the program ROM space allocation for the following:

(i) EA=0 for 8751 chip

(ii) EA=Vcc with both on-chip and off-chip ROM for 8751.

### [Solution to Question 2](#)

## Module 2

3. a. Explain the following assembler directives:

(i) DB

(ii) ORG

(iii) EQU

b. Explain the working of the instruction SUBB when borrow=0 and borrow=1.

c. A student has to take 6 courses in a semester. The marks of the student out of 25 are stored in RAM locations 50h onwards. Write a program to find the average marks and save it in register R6.

### [Solution to Question 3](#)

4. a. Write a program to complement the value AAh, 800 times.

b. With respect to Port 0, explain the following:

- (i) Working of Port 0
- (ii) Dual role of Port 0
- (iii) Example program to use Port 0 as input and output.

c. Write a program to generate a square wave of 50% duty cycle on bit 5 of Port 2.

#### [Solution to Question 4](#)

### **Module 3**

- 5. a. Write an 8051 'C' program to send values -4 to +4 to Port P1.
- b. Write an 8051 'C' program to toggle all bits of P0 and P2 continuously with 250 ms delay.
- c. Write an 8051 'C' program to convert packed BCD 0x28 to ASCII and display bytes on P1 and P2.

#### [Solution to Question 5](#)

- 6. a. Explain Mode-1 programming of 8051 timer. Describe different steps to program in Mode-1.
- b. Write 8051 assembly program to generate square wave with  $t_{ON}=3ms$  and  $t_{OFF}=10ms$  on all pins of Port 0. System clock is 22 MHz. Use timer 0 in Mode1.

#### [Solution to Question 6](#)

### **Module 4**

- 7. a. Describe bit status of SCON register.
- b. Write 8051 assembly program to receive the data in serial form and send it out to Port 0 in parallel form. Save the data in RAM location 62h. Assume baud rate = 9600. Use timer 1 in mode 2.
- c. Calculate the baud rate if  $TH1 = -2$ ,  $SMOD = 1$ ,  $XTAL = 11.0592$  MHz. Is this baud rate supported by IBM PCs?

#### [Solution to Question 7](#)

- 8. a. Explain the steps in executing an interrupt.
- b. Write 8051 assembly program in which 8051 reads data from P1 and writes it to P2 continuously while giving a copy of it to serial COM port to be transferred serially. Assume baud rate = 9600 and  $XTAL = 11.0592$  MHz. Use timer 1 in mode 2.

c. Explain the bit status of IP register.

[Solution to Question 8](#)

**Module 5**

9. a. Calculate the address range of 16x2 LCD and 20x1 LCD.

b. Explain the internal architecture of ADC 0804 and its timing diagram to convert analog data to digital form.

c. Consider 8-bit ADC. Assume  $V_R=5$  V. Calculate the 8-bit digital output when  $V_{in}=3$ V.

[Solution to Question 9](#)

10. a. Write 8051 assembly program to rotate a stepper motor  $64^\circ$  in clockwise direction. The motor has step angle of  $2^\circ$ . Use 4 step sequence and draw the schematic diagram. Steps per revolution = 180, number of rotor teeth =45, Movement per 4 step sequence = $8^\circ$ .

b. What is PWM technique? Explain bidirectional motor control using L923 chip. If SW=0, the dc motor moves clockwise and if SW=1, the dc motor moves counter clockwise. Draw the schematic diagram. Write 8051 assembly program to do this.

[Solution to Question 10](#)