6. (a) What are different serial I/O modules available in mid-range PIC microcontroller? Discuss SPI module for port expansion. Explain related SFRs. (7.5)

(b) Discuss meaning (with format and example) and flags affected by following instructions :
(i) movf (ii) swapf (iii) clrwdt (iv) retlw (v) rlf (vi) btfsc (vii) decfsz. (7.5)

7. Explain all the interrupts and associated SFRs in the 8051 microcontroller. Write a program using interrupts to do the following :
(a) Receive data serially and send it to Port 2
(b) Configure Port 1 as input, read it, transmit data serially
(c) Program timer0 to generate a square wave of 5 KHz frequency on Port0.1. Assume that XTAL=11.0592 MHZ. Set the baud rate at 9600. (15)

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December 2023
B.Tech. (ENC) V SEMESTER
Embedded System Design (ECP-501)

Time : 3 Hours] [Max. Marks : 75

Instructions :

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*
2. *Answer any four questions from Part-B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*
4. *Assume data wherever required.*

PART–A

1. (a) What are the advantages and disadvantages of using Harvard architecture in comparison to Princeton? (1.5)

(b) What is the Baud rate in serial communication? In 8051, for serial communication in mode 1, how the Baud rate is calculated? (1.5)

(c) Discuss how instruction pipelining is implemented in PIC? (1.5)

(d) What is the maximum delay the Timer0 produces when 8051 is operated at 22MHz? Give calculations. (1.5)

(e) In 8051, after the instruction MOV IP, #00011000. what will be the priorities of interrupts? (1.5)

(f) Which bits in which register(s) must be set to make INT0 level activated, and INTI edge triggered? (1.5)

(g) The following program generates a square wave on pin P 1.5 Using timer 1. Find the frequency. Consider XTAL = 11.0592 MHz

```
        MOV TMOD, #10H
AGAIN : MOV TL1, #26H
        MOV TH1, #71H
        SETB TR1
BACK :  JNB TF1, BACK
        CLR TR1
        CPL P1.5
        CLR TF1
        SJMP AGAIN
```

(1.5)

(h) What are the various architectural features of PIC? (1.5)

(i) Find the value of INTCON, PIE and PIR registers for enabling the following interrupts: Timer 1, USART for data transmission and external interrupt.

(j) Write short note on Intel Hex Format object file.

PART–B

2. (a) Draw the port structure of 8051 and explain its working. A switch SW is connected to pin P1.4. Write a program to output 00H on port1 if SW=0 and FFH on port1 if SW=1. (7.5)

   (b) Why interrupt is an important feature of a controller? Discuss different interrupt sources available for PIC. Explain associated SFRs. (7.5)

3. (a) Sketch the interface of a 16ch × 1 line LCD to the 8051 microcontroller. Write an 8051 assembly program segment to display any character. (7.5)

   (b) What is an embedded system? Enlist and explain its components. What are the applications of an embedded system? (7.5)

4. What is meant by pre-scaling and post-scaling in PIC microcontroller? Discuss the timer 1 and 2 operations and write the various steps to initialize them stating appropriate control words in the associated SFRs. (15)

5. (a) Write a program to add 10 numbers stored in bank 0 starting at address 20H in RAM. Store the result at RAM address 30H and 31H using PIC instructions. (7.5)

   (b) The speed of a stepper motor has to be controlled using an 8051 microcontroller. Design the required hardware and explain the necessary software.