

UNIT - 2
Interrupts & Timers

A

1. Explain briefly about various types of timer & its architecture.

The PIC 16C74 has 3 modules.

Timer 0,
Timer 1
Timer 2

Timer 0 & Timer 2 are 8 bit timers. Timer 1 is a 16 bit timer.

Timer 0:-
Module is a simple 8 bit up counter. The clock source can be either the internal clock or external clock.

The counter 0 sets a flag TOIF when it over flow & can cause an interrupt.

option:- Registration configuration register control pre scalar & option

Timer 0 clock source. The following option register configuration for clock source

Timer 0 use with out pre scalar
Timer 0 use with pre scalar.

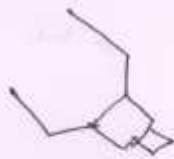
2. with neat sketch explain briefly about Front Panel I/O & SOTL keys.

Designers of instrument & other devices that require user instruction.

Interaction with key switches raise several issues on their own. As PPM or key switches also rise.

Soft keys:-
A multiple line LCD display present the opportunity of being used with miniature switches are aligned.

Push button



(Diagram)

It can be treated in same manner as 12 keys of keypad. Key switches are generally graft in to any as this whether they are physically graft together.

3) Explain briefly about static machine x

Key switches:-

→ Because key switches are not charged. Key fast they can be checked once each time around main line look in a key switch

Subroutine
- The press & release of a key switch occur over an interval of many tens of milliseconds. For eg. if key switch is pressed

released at relatively fast rate of four times a second.

Diagram of Flow chart of Key switch Subroutine (display) 5.

The Grayhill rotary pulse generator shown here and described from Hewlett Packard RPG.

It also features an integral momentary action push button switch. when used with an alpha numeric display such the RPG knob be pushed & released

The PIC interface for the Gray hill RPG. The momentary action push button switch can be treat way in the same way in the soft key.

then it will be debounced at register 10ms interval, just as done with any other momentary action key switch.

The RPG o/p must be treated differently from key switch since the information they convey is represented by two o/p level to their

character For the application the incrementing of RPG - Interval must be stopped when it reaches H'FF' & reset to zero time the

RPG o/p.

with next sketch explain the PIC micro controller In the interrupt method when ever any device needs the micro controller's service. The

device notifies it by sending an interrupt

Merits Interrupt:-

→ The advantage of Interrupt is the micro controller can save many device each device can get attention of micro controller based on priority.

→ The most important reason that interrupt method is preferable is that polling device that don't need service.

→ A waste micro controller time that could have been used to perform some useful task.

In case the timer if we use interrupt method the micro controller can go about doing other task.

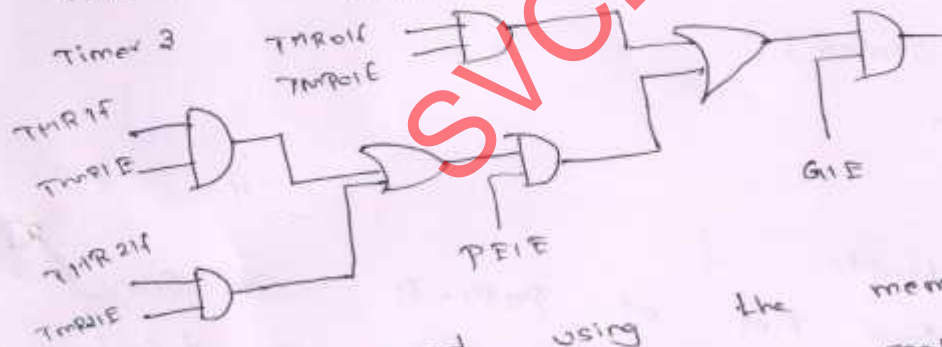
when TMR0IF flag is raised the timer will interrupt the micro controller.

Interrupt Service routine:-
For every interrupt there must be an interrupt service routine when an interrupt is invoked. For every interrupt a fixed location.

5) with neat sketch briefly explain the external interrupt:-
The response of PIC microcontroller to an external event can be initiated by a main line for change an i/p port pin. that look satisfactory for events. this is relative to how are stored.

The setup for this independent interrupt I/P. The PBO/INT pin is automatically configured as a Schmitt trigger. The INTCON register must be initialized with a one in INTF RBO as well as in ILS GIE when interrupt occur there is no need to read port

| Interrupt | Flag Bit | Register | Enable Bit | Register |
|-----------|----------|----------|------------|----------|
| Timer 0 | TMR0IF | PIR1 | TMR0IE | PIE1 |
| Timer 1 | TMR1IF | PIR1 | TMR1IE | PIE1 |
| Timer 2 | TMR2IF | PIR2 | TMR2IE | PIE2 |
| Timer 3 | TMR3IF | PIR3 | TMR3IE | |



1. we must avoid using the memory space allowed to the interrupt vector enable. We place all initialization code. The GOTO instruction 00000 redirects the Timer 0 interrupt.
2. In the main program. The instruction "BSF TMR0IE" with

6. Explain briefly the construction & operation

of Loop Time Subroutine:-

with help of Timer 2 subroutine in INT service loop time subroutine that is called from with in main line loop is able to make the time around loop take exactly same

Diagram:- Timing diagram showing relationship b/w the execution of mainline loop task & interrupt during task.

bftss scalar 7 :- wait for 00000000 -> 11111 change

go to loop time

mov lsr 5

addw scalar f

return

PORTB

change interrupt:-

Four pins of PORT-B can cause an interrupt when any changes are detected on any one of them. They are referred to as PORT-B change interrupt Do



| 12 | Microcontroller and System Design | Two Marks Questions and Answers | 13 |
|------|---|--|----|
| 6. | Write a program to add two 16 bit numbers. (Jan '13) | <pre> Ans: ORG 0030H MOV R0, #123H MOV R1, #60H MOV R2, #10 REPT MOV A, @R0 MOV @R1, A INC R0 INC R1 DINC R2, REPT HERE: SJMP HERE </pre> | |
| Ans: | <pre> MOV DPTH, #2040H MOV A, #2B MOV B, #20 ADD A, DPL MOV DPL, A MOV A, B ADDC A, DPH MOV DPH, A Loop: SJMP Loop </pre> | 11. List the applications of microcontroller. (May/June 2009) | |
| 7. | Write the operation carried when the instruction MOVCA, @A + PC is executed by 8051. (June '12) | <pre> Ans: • Stepper motor interfacing • Length measurement • Square wave generator • Traffic light control </pre> | |
| Ans: | <p>This instruction moves a byte of data located in the program (code) area to A. The address of the desired byte of data is formed by adding the program counter (PC) register to the original value of the Acc.</p> | 12. Write a program using 8051 assembly language to change the data 55h stored in the lower byte of the data pointer register to AAh using rotate instruction? (November-2010) | |
| 8. | What are the different operations performed by Boolean variable instruction of 8051. (May '11) | <pre> Ans: MOV DPL, #55H MOV A, DPL RLA LABEL: SJMP LABEL </pre> | |
| Ans: | <p>Boolean Variables are: AND – AND operation, OR – OR operation, XOR – XOR operation, NOT – NOT operation, Rotate and SWAP operations.</p> | 13. Explain the contents of the accumulator after the execution of the following program segments? (November-2010) | |
| 9. | Define TASK. | <pre> Ans: MOV A, #0C11H MOV R4, #60H ANL A, R4 A ← 0C; R4 ← 60; A24 </pre> | |
| Ans: | <p>Task is nothing but the operations performed by the operating system or applications executed by the operating system. If more than one task can be running at one time, then the operating system is known as multitasking operating system. Each task is given a short slice of the processor's execution, which allows it to execute all or part of its function before control is passed to the next task in line.</p> | | |
| 10. | Write an 8051 assembly language to copy 10 bytes from RAM starting at 35H to RAM starting at 60H. (November-2010) | | |

Microcontroller based System Design

1. Write a program to mask the 0th and 7th bit using 8051?

Ans: `MOV A, #data`
`ANLA, #81`
`MOV DPTR, #4500`
`MOVX @DPTR, A`
`LOOP SJMP LOOP`

5. Write about CALL statement in 8051?

Ans: There are two sub-routine CALL instructions, they are:

- LCALL (Long CALL)
- ACALL (Absolute CALL)

Each instruction the PC to the 1st byte of the instruction and pushes them into the stack.

6. Write a program to load accumulator DPH and DPL using 8051?

Ans: `MOVA, #30`
`MOV DPH, A`
`MOV DPL, A`

7. Mention the importance of RTOS for real time applications.

Ans: A key characteristic of an RTOS is the level of its consistency concerning the amount of time taken to accept and complete an application's task; the variability is *time*. A *hard* real-time operating system has less *time* than a *soft* real-time operating system. The chief design goal is not high throughput, but rather a guarantee of a soft or hard performance category. An RTOS that can usually or generally meet a *deadline* is a soft real-time OS, but if it can meet a deadline deterministically it is a hard real-time OS.

18. State the significance of RTOS.

Ans: Key factors in a real-time OS are minimal interrupt latency and minimal thread switching latency; a real-time OS is valued more for how quickly or how predictably it can respond than for the amount of work it can perform in a given period of time.

19. What are the distinct address spaces supported by 8051.

Ans: The 8051 architecture supports several distinct physical address spaces.

Two-Marks Questions and Answers 15

(a) On-chip program memory, (b) On-chip data memory
(c) External program memory, (d) External data memory
(e) On-chip special function registers.

20. What is the significance of Interrupt Priority Control Register in 8051 micro controller?

Ans: Register IP bits determine if any interrupt is to have a high or low priority. Bits set to 1 give the accompanying interrupt a high priority; a 0 assigns a low priority.

PART-B (SEVENTEEN MARKS)

1. (i) Write 8051 ALP to arrange to 8-bit data in the internal RAM stored as an array from the address 50H in descending order. (June '12)

(ii) Write an ALP for the conversion of analog signal into a digital value through successive approximation technique. (June/July 2013)

2. Write 8051 ALP to generate a square wave of 400Hz in port pin P1.4 by using timer1 overflow interrupt. (June '12)

3. (i) Write a program to bring in a byte of data serially one bit at a time via P1.0. (Jan '13)

(ii) Write a program to toggle the bits of P1, while creating a time delay of 200 ms. (Jan '13)

(iii) Write a program to get a value from P1 and send the square of its value to P2 continuously. (Jan '13)

4. Analyse the importance of the interface operations of RTOS like along with its explanation. (June '12)

5. Design a task diagram for LCD digital clock/thermometer using FULL RTOS and explain it. (June '12)

6. Explain in detail about RTOS with examples. (Jan '15/July 2013)

7. Discuss in detail about applications of different RTOS for 8051 with necessary diagrams. (Jan '13)

8. (i) Write an assembly language program to copy the value 55H into RAM memory locations 40H to 4FH using register indirect addressing with a loop.

(ii) Assuming the clock pulse is fed into P1.7, Write a program for counter 1 in mode 2 to count the pulses and display the state of the TL1 count on P2.

9. Explain the data transfer, data manipulation, control and I/O instructions.

10. Discuss in detail about interrupt facility and its programming technique using RTOS.