

Unit - 1 16 Mark
 1. Explain briefly the block diagram of PIC16C7X and its features:-

Block diagram of PIC16C74A

- * High Performance RISC CPU.
- * Only 35 single word instruction
- * 1 instruction cycle except for program branch
- * Operating speed DC - 20MHz clock / 1P
DC - 200ns instruction cycle.
- * Interrupt capability.
- * Eight level deep hardware stack.
- * Direct, indirect & relative address mode
- * Power on Reset
- * Power saving sleep mode
- * wide operation voltage range:- 2.5V to 6.0V
- * Low Power consumption:-
 $< 2\text{mA}$ @ 5V, 4MHz
 15mA typical @ 3V, 32kHz.
 $< 1\text{mA}$ typical stand by current.

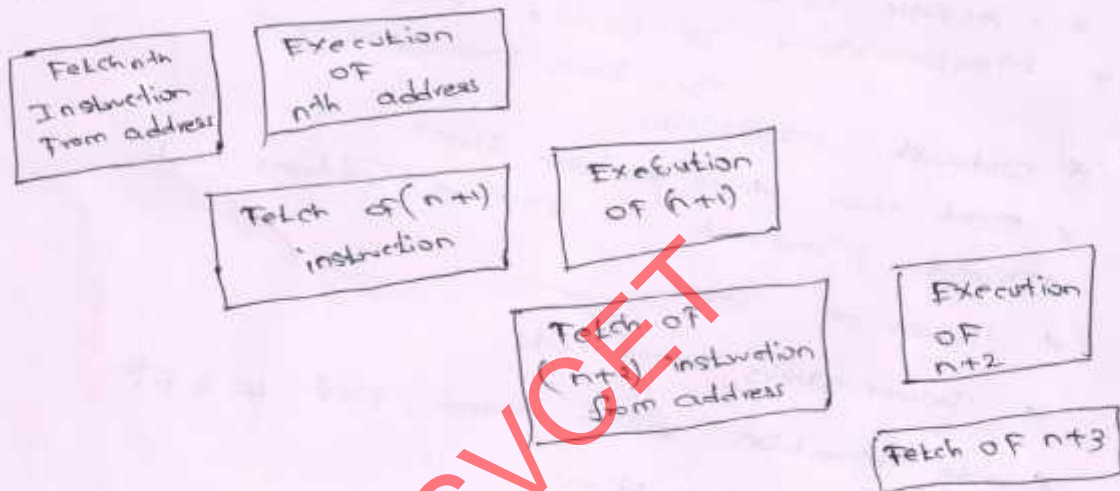
PIC 16C7X Peripheral features:

- * Timer 0:- 8 bit timer/counter
- * Timer 1:- 16 bit timer/counter
- * Timer 2: 8 bit timer/counter
- * Parallel Slave Port
- * Brown out detection.

2) Explain briefly about PIC 16cxx PIPING.

* Diagram of hardware Architecture.

* Every instruction is coded as single 14 bit word & fetched over 16 bit wide bus. Consequently as instruction are fetched from successive program memory location.



This lock step progression is broken when ever an instruction set + while this (n+2) instruction is locate in program immediately after (n+1)th go to new address instruction

2. with neat circuit diagram explain the program memory consideration:-

Each member of PIC 16c6x/7x family of microcontroller included has either 2k.

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Diagram of Program memory access for PIC parts having 2k of program memory. When we deal with tables, the program code can be simplified to some extent if any tables that are created are assigned to address in range 11005-110FF. For most applications these 250 locations provide more than enough.

Main line: -

Call initial; Initialize everything

Main loop

Call Task 1 :- Deal with Task 1

Call Task 2 :- Deal with Task 2

Call Loop Time :- Force loop time to fixed value

(1) Diagram of Program memory req. instructions are loaded

Bits 10 -- 0 of Call Program Counter

f. Explain briefly about various addressing modes:

* The method of specifying data to be operated by an instruction

- X Direct Addressing mode
- X Indirect Addressing mode

Indirect Addressing mode:-

A special Purpose Register that serves as an address pointer to any address through out entire register file.

→ Diagram of indirect addressing mode.
→ Diagram of Direct/indirect address mode.

Instruction set:-

Byte oriented instructions:

The byte oriented instruction that receive two parameter. - w if the destination is to be working register.

bcf F, b clear bit register

Bit oriented Instruction:-
Bit oriented instruction also expect parameter here F is to be replaced by name of a special purpose register or name of RAM variable. the 'b' parameter is to be replace by a bit number

Bit Literal Instruction:-

The Literal instruction receive an operand having known value or a label

that represent a known value.

Num evaluation 0AH; assign 0AH to label Num
Movi wnum: will move 0AH to w register

5. Explain briefly about the simple operation. ?

* Decrement of 16 bit counter
with only 35 instructions shown
Filter or sequence:-

Assume that an instruction that affect
Z bit has just been executed.

b7c stabs Z; Test Z bit, skip if clear

got Z get

Z clear : Instruction to execute
if Z=0

goto Z done Instruction to execute

goto Z if Z=1

Z set
Carry on

Single-bit Manipulation:-

PORTB.0 :- clear bit 0 of PORTB

STATUS.C :- Set the carry bit

clear/move

clrW :- clear the working register, W

clrF Temp1 :- clear Temporary variable Temp1.

movWF Temp1 :- mov W in to Temp1.

6. Explain in brief the various types of

modes:-

compare mode:-

compare mode for CCP2 is similar

to CCP1, except that in special

CCP1 reset TMPR1 only

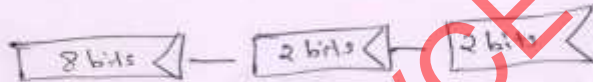
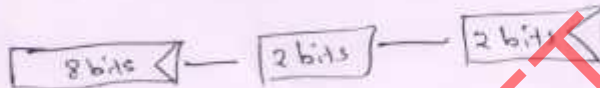
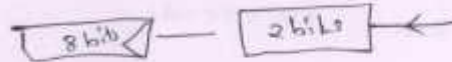
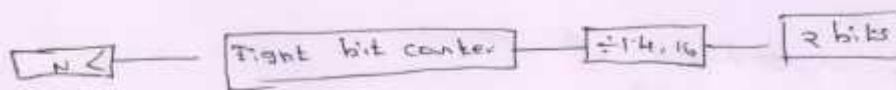
1. RC2/CCP1 pin must be configured as O/P
2. Timer 1 should be in timer mode.

Pwm Period:

TMPr2 is cleared

CCP1 pin set

Pwm duty cycle is latched.



$$\frac{\log\left(\frac{F_{osc}}{F_{pwm}}\right)}{\log 2}$$

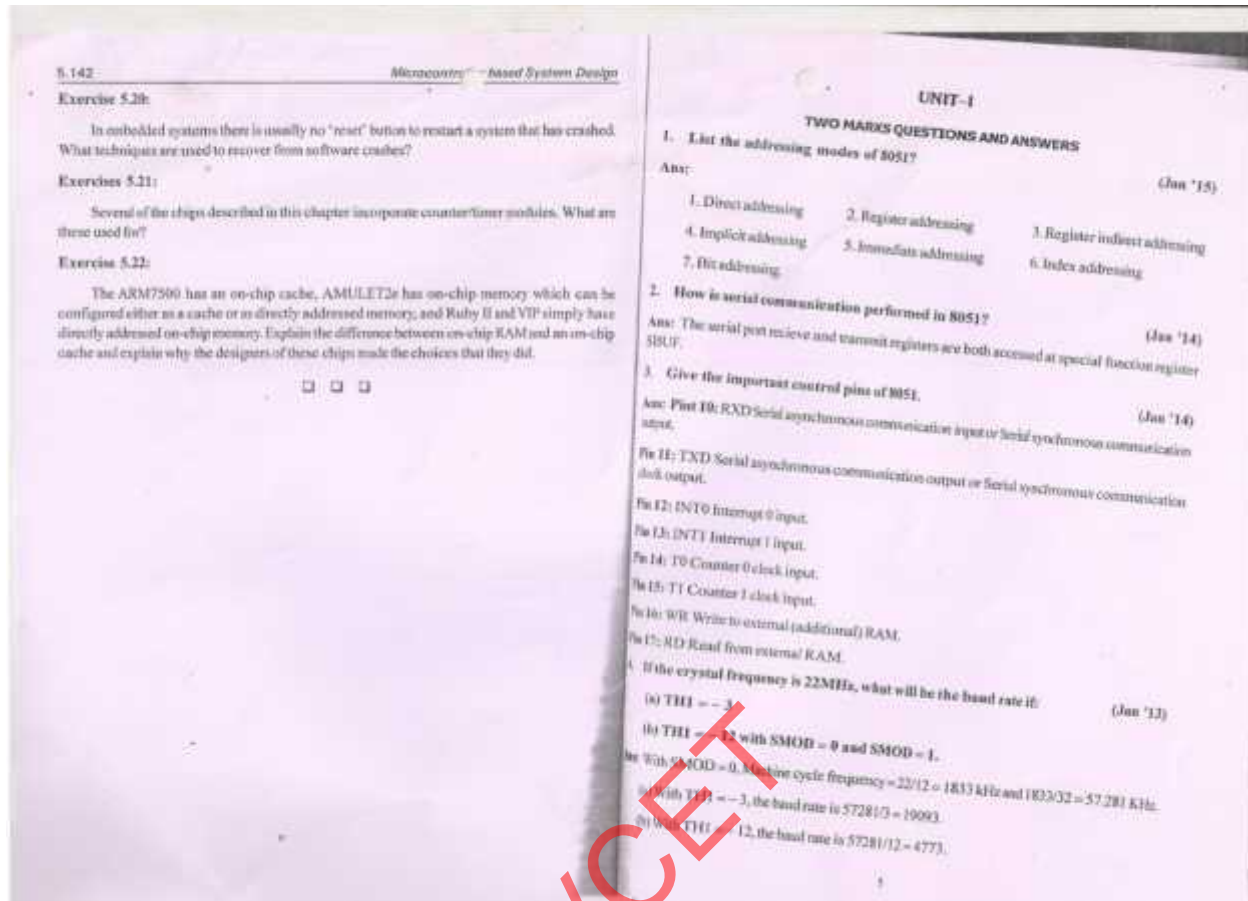
Desired Pwm frequency = 78.125 KHz

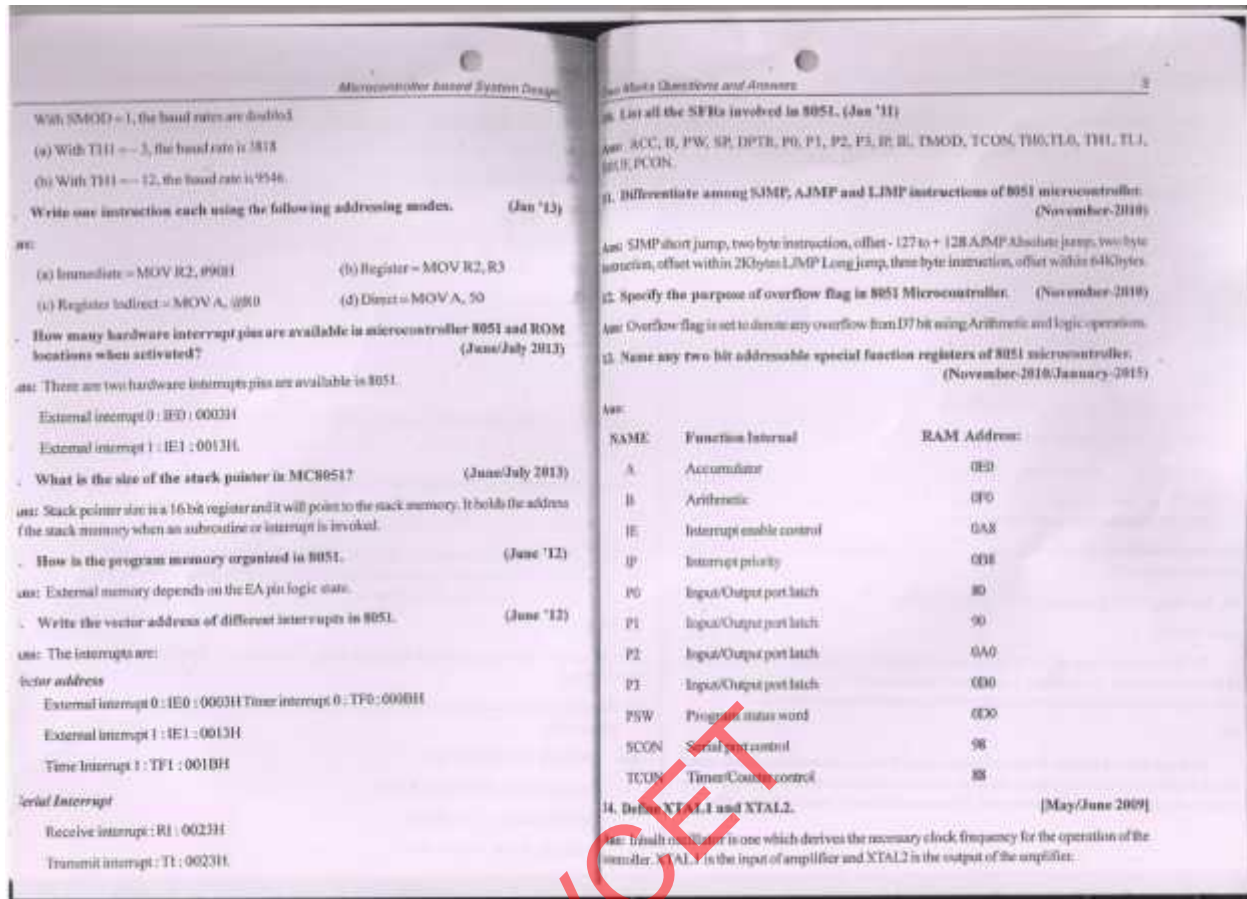
$f_{osc} = 20 \text{ MHz}$

$$\frac{1}{78.125 \times 10^3} = (PR2 + 1)4 \times \frac{1}{20 \times 10^6}$$

$$\therefore PR2 = 63$$

$$\frac{1}{78.125 \times 10^3} = 2 \text{ PWR Resolution } \frac{1}{20 \times 10^6}$$





<p>4 Microcontroller and System Design</p> <p>15. What is meant by microcontroller?</p> <p>Ans: A device which contains the microprocessor with integrated peripherals like memory, serial ports, parallel ports, timer/counter, interrupt controller, data acquisition interfaces like DAC is called microcontroller.</p> <p>16. Give the alternate functions for the port pins of port3?</p> <p>Ans: RD, WR, T1, T0, INT 1, INT 0, TXD, RXD</p> <p>RD - Read data control output WR - Write data control output T1 - Timer/counter 1 external input or test pin T0 - Timer/counter 0 external input or test pin INT 1 - Interrupt 1 input pin INT 0 - Interrupt 0 input pin TXD - Transmit data pin for serial port in UART mode. RXD - Receive data pin for serial port in UART mode.</p> <p>17. Specify the single instruction, which clears the most significant bit of B register of 8051, without affecting the remaining bits.</p> <p>Ans: Single instruction, which clears the most significant bit of B register of 8051, without affecting the remaining bits, is CLR B.7.</p> <p>18. Explain the 16-bit registers DPTR and SP of 8051.</p> <p>Ans: DPTR: DPTR stands for data pointer. DPTR consists of a high byte (DPH) and a low byte (DPL). Its function is to hold a 16-bit address. It may be manipulated as a 16-bit data register. It serves as a base register in indirect jumps, lookup table instructions and external data transfer.</p> <p>SP: SP stands for stack pointer. SP is a 8-bit wide register. It is incremented before data is stored during PUSH and CALL instructions. The stack array can reside anywhere in-chip RAM. The stack pointer is initialized to 07H after a reset. This causes the stack to begin at location 08H.</p>	<p>Two Marks Questions and Answers</p> <p>19. Name the special functions registers available in 8051.</p> <p>Ans: Accumulator, B Register, Program status Word, Stack pointer, Data pointer, Port 0, Port 1, Port 2, Port 3, Interrupt priority control register, Interrupt enable control register.</p> <p>20. List the features of 8051 microcontroller?</p> <p>Ans: The features are:</p> <ul style="list-style-type: none"> • 4096 bytes program memory on chip (not in 8031) • 128 data register banks • Four register inside, 16-bit timer/counter • Extensive Boolean processing capabilities • 64 KB external RAM size • 32 bit-directional individually addressable I/O lines. <p>21. What is the difference between 8051 and PIC? (Jan '15)</p> <p>Ans:</p> <ul style="list-style-type: none"> • 8051 is microcontroller which contains the microprocessor with integrated peripherals like memory, serial ports, parallel ports, timer/counter, interrupt controller, data acquisition interfaces like DC, DAC is called microcontroller. • PIC refers to Programmable Intelligent Computer. PIC is microprocessor lies inside a personal computer but significantly simpler, smaller and cheaper. It can be used for operating relays, measuring sensors etc. <p>22. What is I/O port of PIC? (Jan '14)</p> <p>Ans: I/O port is used to get and send the data from/to external devices. Some I/O pins have multifunctions.</p> <p>23. Write any four instructions of PIC microcontroller and state in a line the operation performed. (Jan '14)</p> <p>Ans: <code>MOVLW 25H; WREG = 25</code> <code>MOVLW 0X34; ADD 34H to WREG</code> <code>MOVLW ADD 11H TO WREG</code> <code>ADDLW; W = W + 12H = 7CH</code></p>
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8 *Microcontroller Based System Design*

39. What is indirect addressing mode?
 Ans: Indirectly addressing the memory used in FSR and INDF instruction. Here the operand is specified indirectly in the instruction.

40. What is Access bank in PIC18?
 Ans: It is the default bank, which is invoked when power up. It is divided into two equal sections of 128 bytes, which is given to GPR and SFR.

(PART-B) SIXTEEN MARKS QUESTIONS AND ANSWERS

- Derive the internal structure of the MC8051 and explain functional blocks.
 (June/July 2013), (Jan '13, Jan '15)
- State all the addressing modes of MC8051 and explain the corresponding mnemonic through an example.
 (June '14/July 2013)
- Explain in detail the various modes of operation of timers with an application program.
 (Jan '14, Jan '13)
- Write detailed note on how serial communication is handled by 8051.
 (Jan '13)
- With neat diagram explain how interrupts are handled by 8051 with an application example.
 (Jan '13, Jan '15)
- Discuss in detail about the instruction set of 8051.
 (Jan '13)
- Explain the data memory organization in 8051 in detail.
 (June '12)
- Explain the operation carried out when the following instructions are executed by 8051.
 (June '12)

(i) MOV 33H, R0	(ii) MOV @R1, #08H
(iii) MOVXA, @R1	(iv) DJNZ R6, L1 where L1 is a Label.
- With neat diagram, describe the structure of parallel port P0 in 8051 in detail.
 (June '12)
- Discuss the pin details of 8051.
 (June '11)
- Explain the architecture of PIC 16F877 with necessary diagrams.
 (June '12) (June/July 2013) (Jan '13)

Two Marks Questions and Answers

- With a neat diagram discuss in detail about memory organization of a PIC microcontroller.
 (Jan '15, Jan '13)
- What are the addressing modes of PIC microcontroller?
 (Jan '15, Jan '13)
- Design the PIC Timer interrupts at the intervals: 0.5, 1ms, 1.5ms, 3.0ms and this shall be repeated as long as MC is switched ON.
- List and explain the hardware features of timer 1 in PIC16F877 with neat diagram.
 (June '12)
- Explain in detail the various functions of the PORTS in PIC microcontroller.
 (Jan '13)
- Write a program to write the data in memory and EPROM using PIC.
- Create a pulse of a positive going pulse to RC2/CCP1 pin of PIC microcontroller. Assuming $f_{osc} = 4$ MHz and that the pulse width is less than 85535 μ s and longer than 300 μ s using PIC.
- Explain the instruction set of PIC microcontroller.
- Discuss any one application of PIC in detail with necessary diagram.