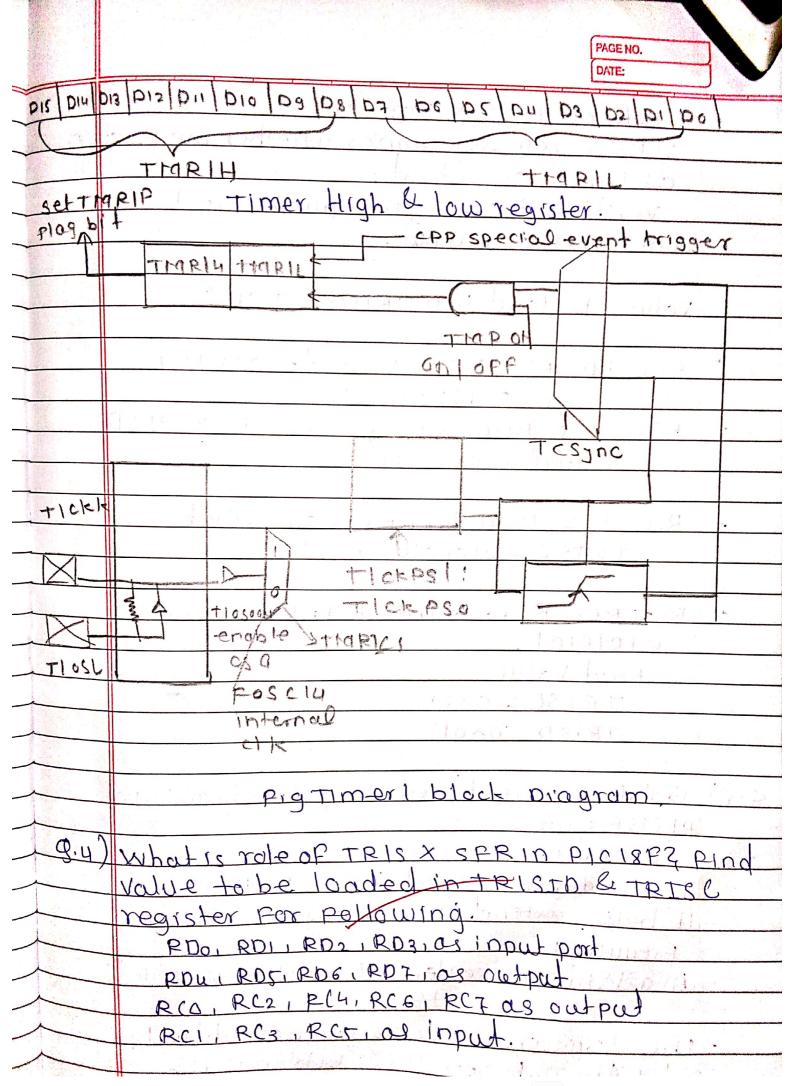Assignment No:-2

Q.1) Name SPRs associated with each I/o part of PIC18F What is role of PORT X SFR?

→ SPRS associated with I/o port in PIC18F - In PIC18F series, each I/o port is controlled by Serveral special Function Register.

1) PORT → Register → stores actual i/o data of port.

2) TRIS X Register → configures each pin as either input (1) or output (o).

3) LAT X Register → used for latching o/p values to reduce read-modify write issue

4) ANSEL x Register → cofigure pin as analog or digital.

− Role of PORT X SFR −

It act as buffer that stores current state of port. When reaching, it show actual logic level at pin & when writing it changes output value.

Q.2) Calculate total delay generated by timer0 if (FFF1) H is loaded into it. Assume Crystal Frequency = 10 MHz.

→ Given,

crystal freq = 10MHz

Timer 0 prescaler = 1

Timer 0 is 16 bit

Timer load value = FFF1H (65521 in decimal)

− Timer clock Freq =

$F_{timer} = \dfrac{F_{oscillator}}{4} = \dfrac{10 \ MHz}{4} = 2.5 \ MHz$

—Timer clock period

$$\text{Timer} = \frac{1}{\text{Ftimer}} = \frac{1}{2.5 MHz} = 0.4 A\mu s$$

$$tcount = 65536 - \text{initial value}$$
$$= 65536 - 65521$$
$$= 15$$

$$\text{Total delay} = tcount \times timer$$
$$= 15 \times 0.4$$
$$= 6 \mu s$$

Q.3) Explain working of PIC18F timer1 with help of suitable diagram.

→ Timer is 16 bit timer & its 16 bit register is split into 2 bytes refer as traRIL & traRIH -timer1 can be programmed 16 bit mode only & unlike timer 0 it does not support 8 bit mode. timer 0 it does not support 8-b Timer1 also has. TICCM register in addition to TRRIPC Flag bit goes high. when traRIH : traRIL overflow from FFFF to 0000 timer1 also has prescaler option built. only supports factors. of 1:1, 1:2, 1:4 & 1:8

D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0

TMRIH

TMRIL

set TMRIP
flag bit

Timer High & low register.

CPP special event trigger

TMRIH TMRIL

TMR oN
on / oFF

TCSync

+Iclk

TIckPS1 :
TICKPS0

tIosoo
-enable →TMRICS
os 0

Foscl4
internal
clk

TI osL

Fig Timer1 block Diagram.

Q.4) What is role of TRIS X SFR in PIC18F? Find value to be loaded in TRISD & TRISC register for following.

RD0, RD1, RD2, RD3, as input port
RD4, RD5, RD6, RD7, as output
RC0, RC2, RC4, RC6, RC7 as output
RC1, RC3, RC5, as input.

→ Role of TRIS X Register -

- TRIS X reg determines whether pin function
as Input or output.
- Writing 1 configures pin as input & 0
configures as output.

Values to load into TRISD & TRISC-

• RD0, RD1, RD2, RD3 as input → TRISD =
      00001111 = 0X0F
• RB4, RD5, RD6, RD7 as output → TRISD
      Remains 00001111

• RC0, RC2, RC4, RC6, RC7, as output -
      TRISC = 01010101 = 0X55

• RC1, RC3, RC5 as input - TRISC remains
      01010101,
         Find Value-
            TRISC = 0X55
            TRISD - 0X0F

Q.5) Explain in detail prescaling & postscaling of
PIC18F timer.
→   • prescaler-
- It divides input clock before feeding it to timer.
- It helps extend timer range by reducing
   frequency
- Available prescaler value ~1:2, 1:4, 1:8, 1:16
                  etc
- The division factor is programmible typi-
cally through specific bits in timer control

register.

- A higher prescaler value result in slower timer increment rate, which is useful for measuring longer duration but reduce timers resolution

* postscaler -

- It operates after time counting register & control frequency of interrupt generation by dividing no of timer overflow required to trigger an interrupt.

- similar to prescaler, postscaler division factor is programmable via specific bit in timer control register.

- e.g - Timer in PIC18F4550 allow for a postscaler setting ranging from 1:1 to 1:16.

Q.6) Draw format of TOCON register & explain functionality of each bit.

Bit	7	6	5	4	3	2	1	0
Name	TMROON	TO8BIT	TOCS	TOSE	PSA	TOPS2	TOPS1	TOPS0

Fig. Format of TOCON reg.

○ Functionality

• TMROON (bit 7) - enable timero (1=ON 30=OFF)
• TO8BIT (bit 6) - 1 = 8bit mode, 0 = 16 bit
• tocs (bit 5) = 1 = external clk, 0 = internal clk
• tocs (bit 4) - select edge for exter clk

$C1 = $ high to low, $0 = $ low to high)

- PSA (bit 3): 1 = no prescaler, 0 = prescaler assigned.

- T0PS2: T0PS0 (bit 2-0) - prescaler value selection (000 = 1:2, 111 = 1:256)

Q.7) Explain working of PIC18F timer 0 in 16 bit made with suitable diagram.

→ Timer 0 -

It can be used as 8 bit or 16 bit timer

The 16 bit register of timer 0 is accessed as low byte & high byte as shown

The low byte reg. is called TMR0L & high register is called TMR0H.

eg - "MOVWF TMR0L" moves value of WREG into TMR0L the low byte of timer. These register can also be read like any other register.

eg - MOVFF TMR0L, PORTB

It copies TMR0L to port B

TMR0H   TMR0L

| D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |

Reg. High & low register.