Sheet 1

1) What are the parameters that must be determined before running any timer?

2) State how timer 0 can be configured to operate as a timer or as a counter? (refer to figure 1.2)

3) Determine the value that should be loaded in T0CON if we want timer 0 to work as 16-bit timer with prescalar value 128.

4) Determine the value that should be loaded in T0CON if we want timer 0 to work as counter and it should increment its count on low-to-high transition.

5) If timer 1 is used with a PIC-based circuit which uses 16MHZ crystal and the prescalar of this timer is chosen to be 1:8. Assume that the initial value that loaded to TMR1L and TMR1H registers are 4D H and 3C H respectively. This timer will operate in 16-bit mode:

   a) Determine the value that should be loaded into T1CON.

   b) Calculate the overall desired time period of this timer. (equation of any timer is $T = 4 * P_S * T_{OSC} * (S_T - I_T)$)

6) If timer 3 is used with a PIC-based circuit which uses 4MHZ crystal and the prescalar of this timer is chosen to be 1:8. Assume that this timer will overflow after total time equal to 0.35 second. This timer will operate in 16-bit mode:

   a) Determine the value that should be loaded into T3CON.

   b) Calculate the value that should be loaded into TMR3L and TMR3H registers. (equation of any timer is $T = 4 * P_S * T_{OSC} * (S_T - I_T)$)

7) Interrupts can be useful in many applications, state these applications briefly.

8) State the core interrupt sources of PIC 18F452 microcontroller.

9) List at least 6 of the peripheral interrupt sources of PIC 18F452 microcontroller.

10) What are the ten registers that control interrupt operations?

11) What are the main three control bits for any interrupt source?

12) List the required steps to setup INT0 as raising-edge triggered interrupt.

13) Is INT0 work as low-priority interrupt? Why?

14) List the required steps to set up timer 0 to cause low interrupt after total time 0.85 sec (assume that a crystal 8 MHZ is connected with its circuit diagram and the prescalar of this timer is chosen to be 1:128).

PIC 18F-based projects

1) Design a PIC 18F452-based system that use timer 0 as counter to count pulses coming from a switch circuit that connected to RA4 pin. Each count should be displayed on a 7-segment (with its built-in decoder) connected to PORTC. When the count of timer 0 reaches to 9, display it and then restart timer 0 to begin counting from 0 again. Make sure that this counter will operate in raising-edge.

2) Repeat the project in problem 1 to make counter operate in falling-edge.

3) Modify the project in problem 1 to make this counter displays counts from 0 to 99 on two 7-segment connected to PORTC and PORTD.

4) Design a PIC 18F452-based system that accept external interrupts from two switch circuits connected to INT0 and INT2. INT0 should operate on raising-edge while INT2 should operate on falling-edge and as low-priority scheme.

When an interrupt trigger comes from INT2, you should display numbers from 0 to 9 on 7-segment connected to PORTD continuously. In case of interrupt trigger from INT0, flash 8-LEDs connected to PORTC for only 10 times with a delay time equal 1 sec.