Final Review

Review Previous Sample Midterms

5) For the following instruction, list the timer being used and It's mode.

        MOV   TMOD, #A0H

        Timer#:   _____

        Mode# and Name of Mode: _____

6) Given that an 8Mhz crystal is connected to the 8051 and you are using Timer 0 in Mode 1 - 16bit. What value would have to be written to TH0 and TL0 in order to cause an overflow after 7.5ms from when the timer is started?

        TH0 = _____ TL0 = _____

7) Given that a 16Mhz crystal is connected to the 8051 and you are using Timer 0 in Mode 1 - 16bit. If TH0 and TL0 were initialized as follows:

        TH0 = A5H,   TL0 = 42H

 How long would it take for the Timer to overflow (specify units in ms)? _____ms

9) Short Answer - What is the best reason to use an interrupt versus polling?

SECTION 9.1: PROGRAMMING 8051 TIMERS

1. How many timers do we have in the 8051?
2. The timers of the 8051 are _____-bit and are designated as _____ and

   _____.
3. The registers of Timer 0 are accessed as _____ and _____.

4. The registers of Timer 1 are accessed as _____ and _____.

6. The TMOD register is a(n) ____-bit register.
7. What is the job of the TMOD register?

9. Find the TMOD value for both Timer 0 and Timer 1, mode 2, software start / stop (gate = 0), with the clock coming from the 8051's crystal.
10. Find the frequency and period used by the timer if the crystal attached to the 8051 has the following values.
    (a) XTAL = 11.0592 MHz   (b) XTAL = 20 MHz
    (c) XTAL = 24 MHz   (d) XTAL = 30 MHz
11. Indicate the size of the timer for each of the following modes.
                          (b) mode 1   (c) mode 2
12. Indicate the rollover value (in hex and decimal) of the timer for each of the following modes. **rollover means overflow**
                          (b) mode 1   (c) mode 2
13. Indicate when the TF1 flag is raised for each of the following modes.
    (a) mode 0   (b) mode 1   (c) mode 2
14. True or false. Both Timer 0 and Timer 1 have their own TF.
15. True or false. Both Timer 0 and Timer 1 have their own timer start (TR).

21. Assume that XTAL = 16 MHz. Find the TH1,TL1 value to generate a time delay of 5 ms. Timer 1 is programmed in mode 1.

22. Assuming that XTAL = 11.0592 MHz, program Timer 0 to generate a time delay of 2.5 ms.

23. Assuming that XTAL = 11.0592 MHz, program Timer 1 to generate a time delay of 0.2 ms.

24. Assuming that XTAL = 20 MHz, program Timer 1 to generate a time delay of 100 ms.

25. Assuming that XTAL = 11.0592 MHz, and we are generating a square wave on pin P1.2, find the lowest square wave frequency that we can generate using mode 1.

26. Assuming that XTAL = 11.0592 MHz, and we are generating a square wave on pin P1.2, find the highest square wave frequency that we can generate using mode 1.

27. Assuming that XTAL = 16 MHz, and we are generating a square wave on pin P1.2, find the lowest square wave frequency that we can generate using mode 1.

28. Assuming that XTAL = 16 MHz, and we are generating a square wave on pin P1.2, find the highest square wave frequency that we can generate using mode 1.

29. In mode 2 assuming that TH1 = F1H, indicate which states timer 2 goes through until TF1 is raised. How many states is that?

30. Program Timer 1 to generate a square wave of 1 kHz. Assume that XTAL = 11.0592 MHz.

31. Program Timer 0 to generate a square wave of 3 kHz. Assume that XTAL = 11.0592 MHz.

32. Program Timer 0 to generate a square wave of 0.5 kHz. Assume that XTAL = 20 MHz.

33. Program Timer 1 to generate a square wave of 10 kHz. Assume that XTAL = 20 MHz.

34. Assuming that XTAL = 11.0592 MHz, show a program to generate a 1-second time delay. Use any timer you want.

35. Assuming that XTAL = 16 MHz, show a program to generate a 0.25-second time delay. Use any timer you want.

36. Assuming that XTAL = 11.0592 MHz and that we are generating a square wave on pin P1.3, find the lowest square wave frequency that we can generate using mode 2.

37. Assuming that XTAL = 11.0592 MHz and that we are generating a square wave on pin P1.3, find the highest square wave frequency that we can generate using mode 2.

38. Assuming that XTAL = 16 MHz and that we are generating a square wave on pin P1.3, find the lowest square wave frequency that we can generate using mode 2.

39. Assuming that XTAL = 16 MHz and that we are generating a square wave on pin P1.3, find the highest square wave frequency that we can generate using mode 2.

PROBLEMS

SECTION 11.1: 8051 INTERRUPTS

1. Which technique, interrupt or polling, avoids tying down the microcontroller?
2. Including reset, how many interrupts does the 8051 have?
12. Show the instruction to enable the EX1 and Timer 1 interrupts.
13. Show the instruction to enable every interrupt of the 8051.
14. Which pin of the 8051 is assigned to the external hardware interrupts INT0 and INT1?
19. With a single instruction, show how to disable all the interrupts.
20. With a single instruction, show how to disable the EX1 interrupt
21. True or false. Upon reset, all interrupts are enabled by the 8051.

25. Which bit of IE belongs to the Timer 0 interrupt? Show how it is enabled.
26. Which bit of IE belongs to the Timer 1 interrupt? Show how it is enabled.
27. Assume that Timer 0 is programmed in mode 2, TH1 = F0H, and the IE bit for Timer 0 is enabled. Explain how the interrupt for the timer works.

29. Assume that Timer 1 is programmed for mode 1, TH0 = FFH, TL1 = F8H, and the IE bit for Timer 1 is enabled. Explain how the interrupt is activated.
30. If Timer 1 is programmed for interrupts in mode 2, explain when the interrupt is activated.
31. Write a program to create a square wave of T = 160 ms on pin P2.2 while at the same time the 8051 is sending out 55H and AAH to P1 continuously.
32. Write a program in which every 2 seconds, the LED connected to P2.7 is turned on and off four times, while at the same time the 8051 is getting data from P1 and sending it to P0 continuously. Make sure the on and off states are 50 ms in duration.

SECTION 11.3: PROGRAMMING EXTERNAL HARDWARE INTERRUPTS

33. True or false. A single interrupt is assigned to each of the external hardware interrupts EX0 and EX1.

35. Which bit of IE belongs to the EX0 interrupt? Show how it is enabled.
36. Which bit of IE belongs to the EX1 interrupt? Show how it is enabled.
37. Show how to enable both external hardware interrupts.

Interrupt and Timer Software Writing Question

We want the 8051 MCU to measure and display the period of an incoming 0 to 5volt SquareWave. The Squarewave may be generated by a function generator or any other source, it doesn't matter. Write a program where 8 LEDs are connected to P0 and 8 LEDs are connected to P1, Timer0 is should be used in 16bit mode, and the SquareWave is connected to the Pin associated with External Hardware Interrupt 0. The External Hardware Interrupt will trigger on the falling edge of the SquareWave. Write the Main function that initializes the Timer Peripheral and the Interrupt, also write the ISR that grabs the Timer0 value and resets the Timer for the next cycle. The ISR should also take the Timer0 Value and display the Upper 8 Bits to the P1 LEDs and the Lower 8 Bits to the P0 LEDs. Essentially, this is system is measuring the Period and Displaying the value to the 16 LEDs…