# CmpE213 – Test II

Name_____

Show all your work in the space provided. Answers with a simple "yes", "no", or a single number are typically incomplete and will not be given full credit. Answers in non-reduced form, like (a+sqrt(b))/c, are fine where appropriate. Good English on essay/short answer questions is required. ON MULTIPLE CHOICE QUESTIONS, IF YOU'RE NOT SURE DON'T GUESS – you will get points off for wrong answers.

1. (10 Points) The figure below shows a keypad connected to the 8051. We would like set a bit variable `pressed=1` if any of the keys: D, 9, 5, or 1 are pressed and set `pressed=0` otherwise. Write a _segment_ of C-code to do this. Use as little code as possible (I was able to do it using 2 statements). If you can't be efficient, write something that works. If you think you need partial credit, explain your answer. Assume the keypad hasn't been scanned yet.

Keypad schematic
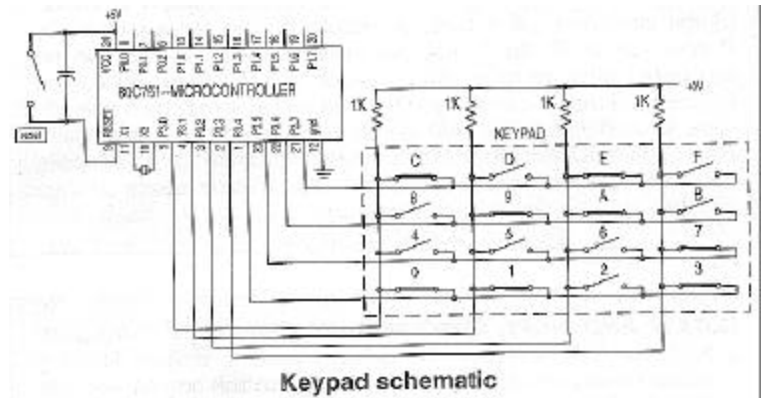
2. (15 Points) Write a _complete_ C-program which does the same as the following assembly code:

```
BSEG AT 22H
    x: DS 2
mydata segment data
    y: DS 1 ; not used – declare anyway.
CSEG AT 0000H
    MOV x, #42H
    MOV A, #2AH
    CLR C
    RLC A
    MOV DPTR, #5280H
    MOVX @DPTR,A
    SETB 12H
```

3. (12 Points) For which of the following situations should you write your code in C or in ASM and for what situations does it not matter which language you use. (Mark the correct answer with an X).

	C	ASM	Doesn't Matter
A. A hardware driver with very precise timing requirements - on the order of microseconds	_____	_____	_____
B. A short task which is executed rarely	_____	_____	_____
C. An application where speed or code size doesn't matter	_____	_____	_____
D. Your program is a few milliseconds too slow. One particular function is executed 90% of the time. That segment should be written in	_____	_____	_____
E. Safety is critical, so the program should be easy to understand and debug.	_____	_____	_____
F. Your code must be out the door yesterday. Your boss tells you to get it out fast at any cost. You write your code in	_____	_____	_____

4. (24 Points) Say we have set aside space for an array, blah, containing 42 elements and we have created a 1-byte variable "i" in internal data space. Write a few instructions of ASM code (not the whole program) to perform the C-code operation **blah[i] = x** when:

    a. (12 Points) blah is an array of char in internal data memory and x is a char in internal data memory

    b. (12 Points) blah is an array of int in internal data memory and x is an int in external memory (If you could not get the code for part a, but understand how it might change for part b, explain how).

5. (24 Points) The following questions each ask you to predict a result after a segment of code has been executed. For each question, assume the contents of memory begin with the values below.

	Internal Direct Addr. mem.		Internal Indirect. Addr. mem.		External memory
0x81	23H	0x81	73H	0x5280	7AH
	:		:		:
0x42	27H	0x39	D0H	0x81	37H
	:		:		:
0x3A	22H			0x42	19H
	:				:
0x27	13H			0x3A	27H
	:				:
0x18	BAH				
	:				

a. (6 Points) Assume x is a 1 byte variable located at memory address 0x3A. After:

     MOV R1, #42H
     MOV x, @R1

x = ?

    a) 42H   b) 27H   c) 22H   d) 7CH

    e) 39H   f) 02H   g) 3AH   h) Unpredictable

b. (6 Points) Assume the declaration "sfr x = 0x81;" has been made at the top of the program. After:

     x = (x&0xFE)|0x18;

x = ?

    a) 98H   b) 1EH   c) 7AH   d) 3AH

    e) invalid expn.   f) logical 1   g) 3E   h) Unpredictable

c. (6 Points) Assume the declaration "char idata x _at_ 0x81" has been made at the top of the program. After:

     ACC = x + XBYTE[0x42];

ACC = ?

    a) 79H   b) 8CH   c) 5EH   d) 4AH

    e) 3CH   f) 50H   g) 56H   h) Unpredictable

(Problem 5, continued)

   d. (6 Points) After:

           DSEG AT 27H

               x: DS 1

           CSEG AT 00H

               MOV DPTR, #5280H

               MOVX A, @DPTR

               MOV X, A

               SETB 3AH

               CLRB 39H

  x = ?

      a) 7CH   b) 7AH   c) 15H   d) 25H

      e) 27H   f) 13H   g) 42H   h) Unpredictable

6. (15 Points) Write an ASM program, complete with segment and variable declarations, to create a square wave on P1^5 with a 10% duty cycle (i.e. on 10% of the time and off 90% of the time) and a period of a "few" hundred machine cycles. You don't have to be precise on the period, but you should be in the right ballpark. Define any constants using the EQU directive. Use relocatable segments.

        P1^5

          10%   90%