EE213 - TEST I

NAME _____

Show all your work in the space provided.
Answers with a simple "yes", "no", or a single number are incomplete and will not be given full credit. Answers in the form: ans = $\frac{a+sqrt(b)}{c}$ are fine where appropriate.

Problem 1. (5 points) Why do we refer to the 8051 microcontroller "family"? (List at least 4 features that may vary between family members).

Problem 2. (5 points) What are the major "costs" of expanding the RAM of the 8051?

Problem 3. (5 points) With off-chip RAM attached, what happens if you write a whole byte out to port P3? (Recall that P3 has bits associated with external control lines).

Problem 4. (12 points) Given the values of registers and memory shown below, for the following instructions, predict which registers will be modified and give their new values. Also list the *hand assembled* hex bytes (machine code) necessary to carry out the instruction. (HINT: PSW.7=Carry Flag, PSW.6=Aux. Carry Flag, PSW.4,3=Register select bits, PSW.2=overflow flag, PSW.0=parity flag)

Registers		Internal Memory		External Memory	
A	32H	35H	78H	20DDH	02H
B	14H	36H	80H	2100H	03H
SP	40H	0AH	1AH		
DPTR	142AH				
PSW	81H				
R0	35H				
R1	36H				
R2	15H				
R3	5CH				

a) (4 points) **MOV A, @R0**

b) (4 points) **ADDC A, #E7**

c) (4 points) **DJNZ R1,2AH** (Assume 2AH is the *relative* address)

Problem 5. (5 points) What are the 3 main memory spaces in the 8051-family? How are the two types of RAM space different?

Problem 6. (5 points) Describe the addressing modes used by the 8051 instruction set. What mode is used to access external devices?

Problem 7. (10 points) Shown below is a block-diagram of the GNOME microcomputer. Describe briefly how a JMP instruction would be fetched, decoded, and executed. (i.e. describe how addresses and data will flow within and outside of the processor)

Problem 8. (5 points) Is it better to store often used variables internally or externally? Why? (Be specific).

Problem 9. (10 points) Describe a situation where it is useful to use Register-Bank switching. Be sure to describe *why* it is useful.

Problem 10. (5 points) Describe an instance where a 1-byte and a 2-byte instruction might be used interchangeably.

Problem 11. (13 points) The 8051 doesn't supply any instruction to MOV variables into the program counter. Write a short segment of assembly code showing how one might use the stack to load the PC with the 2-byte address (value) stored beginning at internal memory location 0x58.

Problem 12. (10 points) Write a short segment of assembly code for the 8051 to subtract one 2-byte unsigned integer from another.

Problem 13. (10 points) On a development board, programs are stored in some writable form of external memory (RAM, FLASH mem, etc) instead of in (internal) ROM. Describe how you might add some external hardware to read and write to external code-space. Be sure to describe what that hardware is and how it is wired to the 8051 and to the external memory.