

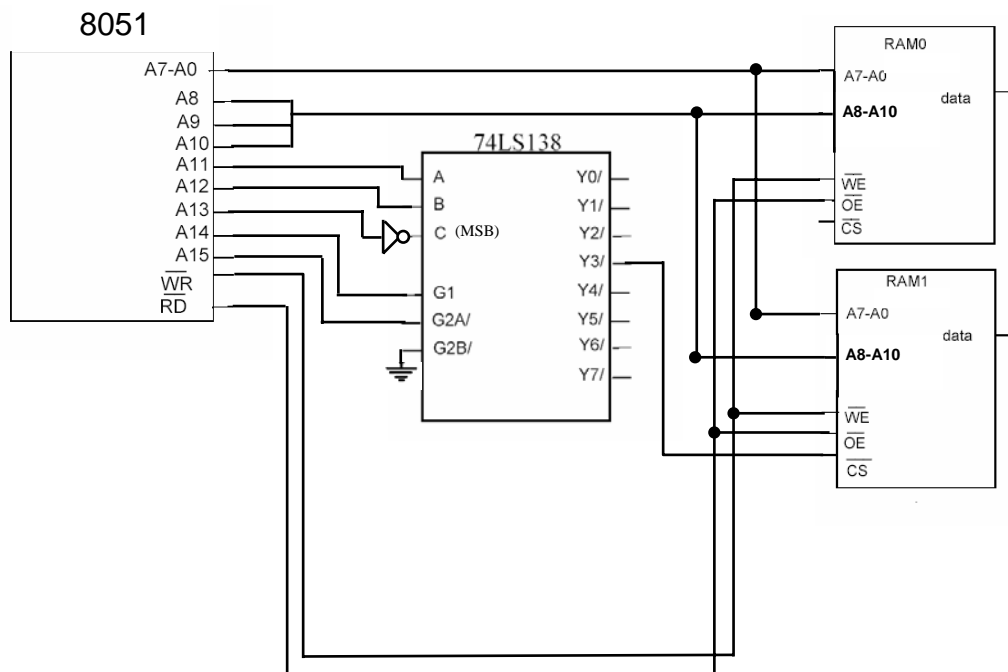
Name

CpE 213 Assignment 5

Due date: Friday September 30 at 3:00 pm

Question 1 (20 points) Assume that an 8051 is connected to external data memory as shown below. Assume that the data lines of the external memory devices have been appropriately connected to the data bus of the processor.

- a. (4 points) Assuming that each location in RAM0 is one byte wide, how many bytes of storage can RAM0 provide? Justify your answer.
- b. (8 points) What is the address range for RAM 1? Specify the start and end addresses of the range. Briefly justify your answer.



Name

Question 1 (continued)

- c. Assume that one of the outputs of the decoder (74LS138) is connected to the CS/ of RAM0, and that RAM0 and RAM1 are the only external memory devices interfaced to the microcontroller.

Suppose that a hypothetical instruction **"MOVX abcd, A"** is used to copy the contents of the accumulator to external memory location abcd.

- c1. (4 points) Would the instruction **"MOVX 0E541H, A"** result in a byte being written to external memory? Why or why not?

- c2. (4 points) Does your answer depend on the particular decoder output connected to the chip select of RAM0? Why or why not?

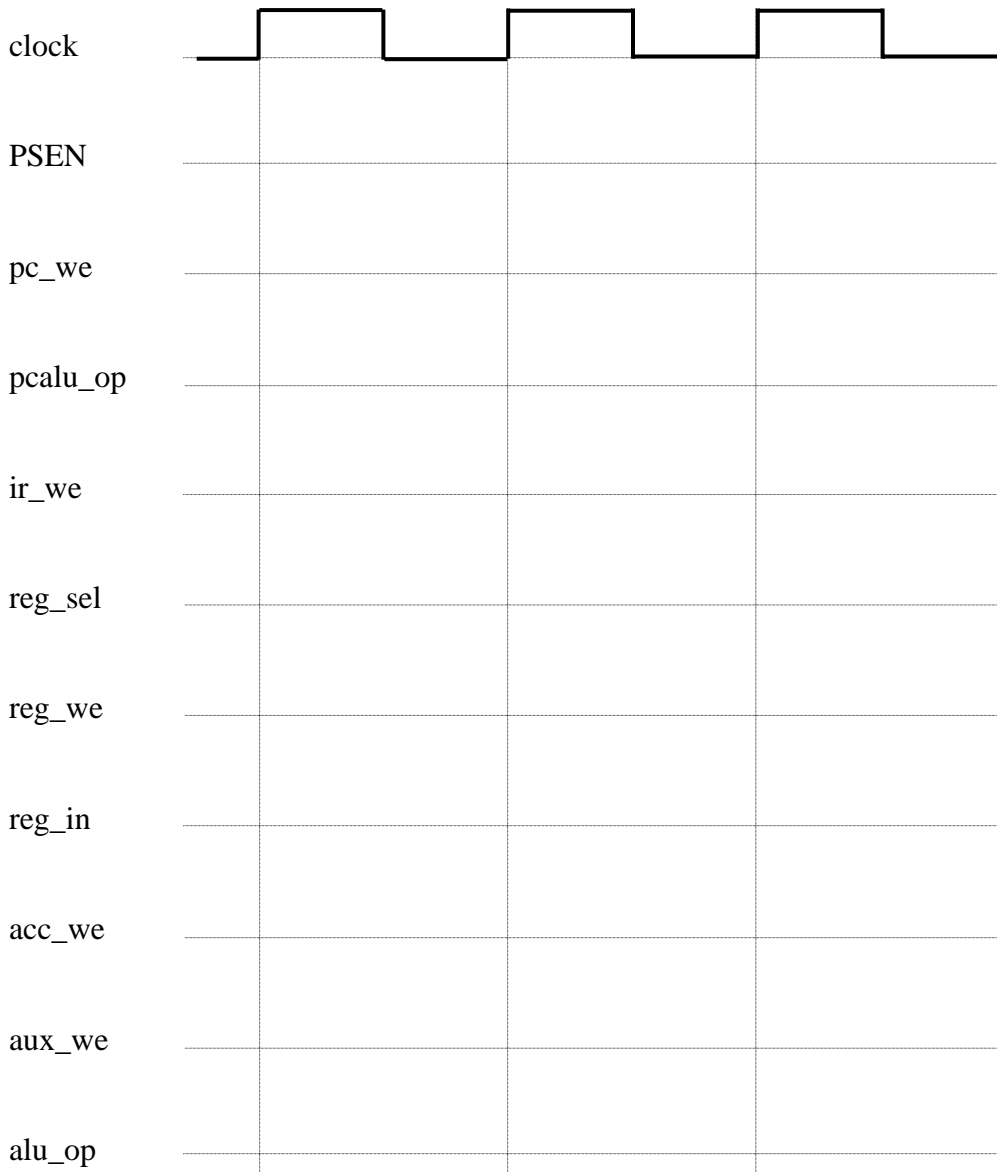
Name

Question 2 (20 points). Draw the timing diagram for the following control signals when the WIMP51 is executing the instruction “**SJMP 21H.**”

The dotted lines have been drawn as a graphical reference only and do not reflect the value of the corresponding signal. If you think a particular control signal is of no significance during a particular time period, indicate this opinion by using a **dashed** line to denote the signal as a “don’t care” for that time period. Give “command” values for pcalu_op and alu_op; for example, indicate the value of “pcalu_op” as “PC_INC” rather than representing this command by a numeric code.

If you are not sure about a particular control signal, make an educated guess, indicate that the value you have marked is a guess, and explain why you made this particular guess.

Hint: PSEN pulses low whenever a byte is being fetched from code memory.



Name

Question 3 (15 points)

- a. (5 points) Is it better to store frequently used variables internally or externally? Briefly justify your answer.

- b. (5 points) Briefly describe a situation where it would be useful to use register bank switching. Briefly describe *why* it is useful.

- c. (5 points) Consider the following 8051 instructions:

- a. MOV 80H, #0AAH
- b. MOV R0, #80H
- c. MOV @R0, #0AAH

Is executing instruction a alone equivalent to executing instructions b and c together (b first, then c)? Briefly justify your answer.

Hint: Pay attention to the addressing mode of each instruction.

Name

Question 4 (25 points) This question of the exam has been replaced because its content is not included on our first exam.

Answer the following questions from Mazidi, pages 60-62 (end of Chapter 2):

31, 34, 35, 36, 37, 39, 40, 41, 42, 43, 45, 47, 48, 49

Question 5 (10 points) Assume that the PSW is 7BH before the following instructions are executed on the 8051.

```
MOV A, #25H
ADD A, #1FH      ; A + 1FH -> A
```

What is the value of the PSW (in binary) after both instructions are executed? Briefly justify the value of each bit of the PSW.

You do not need to compute the value of the PSW after execution of the first instruction; only the final PSW is of interest.

Hint: PSW.7=C, PSW.6=AC, PSW.5=General-purpose flag, PSW.4=RS1, PSW.3=RS0, PSW.2=OV, PSW.1=Not used, PSW.0=P)

