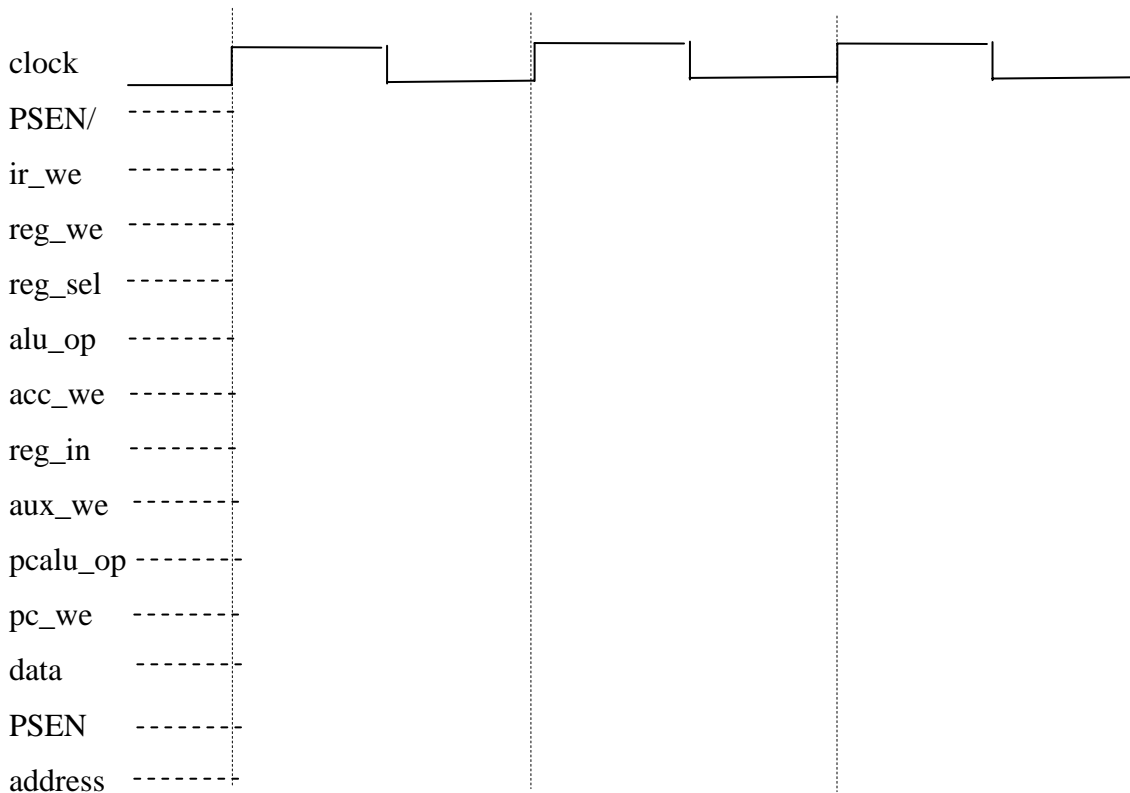


CpE213 Assignment 3

Due: Friday September 16 at 3:00 pm

Note: Just as on tests, I expect you to show all your work. A correct answer with no work might not be given full credit.

1. Draw the timing diagram for the following data and control signals when the WIMP51 is executing the instruction “JZ 42H”, assuming ACC=2AH. If you do not think a control signal is doing anything important, indicate so with a “don’t care” (a dotted line down the middle). Give “command” values for pcalu_op and alu_op rather than numeric values (e.g., give the value as “pcalu_op=PC_INC” instead of “pcalu_op=42”). If you are not sure, make your best guess (but tell me it is a guess and why). Assume the address of the JZ 42H code begins at memory address location 42H.



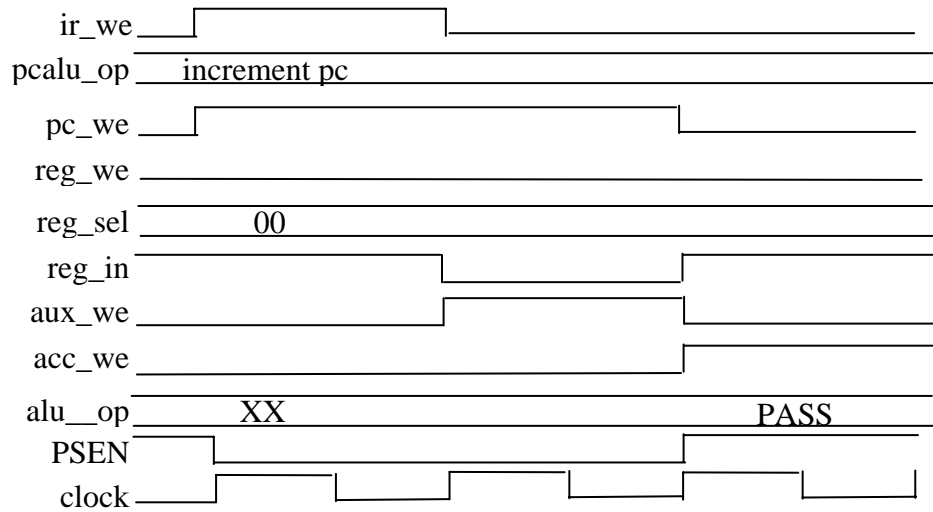
2. For the problem above, indicate the fetch, decode, and execute cycle.

3. For the following WIMP51 code:
 - a. Give the address of each instruction
 - b. Give the opcode for each instruction
 - c. Find the values of the WIMP51 registers PC, ACC, Z, R0, R1, and AUX as the WIMP executes this code.

<u>addr.</u>	<u>ASM code</u>
	MOV A,#42H
	MOV R0,A
	MOV A, #2AH
top:	XRL A, R0
	MOV R0,A
	JZ stop
	SJMP top
stop:	SJMP stop

4. The WIMP51 cannot save data to external RAM as it is currently configured. We would like to modify the WIMP51 to allow it to do this. Specifically, we would like to add hardware to perform the instruction “MOV D,A,” which would move the value of the accumulator into external memory location D. For example, “MOV 42H,A” would move the value in the accumulator to location 42H. Assume D can range from 0 to 255.
 - a. Determine the signal lines that would be needed (external to the WIMP51) to write to RAM.
 - b. Write down the values that would have to appear on these external signal lines to write to RAM (hint: we did something similar when talking about memory).
 - c. Add hardware to the WIMP51 that allows this to happen (I would probably copy the slide of the WIMP51 and write on that). Explain briefly how your hardware works (e.g., step 1: ACC- \rightarrow data, XX - \rightarrow addr, step 2:..., etc).
 - d. Create an opcode for the “MOV D,A” that will not conflict with the other instructions (for example, your opcode cannot start with 01001111 because that's the opcode for ORL A, R7). Show the opcode for the specific instruction “MOV 42H, A.”

5. The following shows a timing diagram of control signals within the WIMP during a single instruction cycle.



- Label the fetch, decode, and execute portions of the instruction cycle on the figure above.
- Identify the instruction executed.