

CIS 350 – INFRASTRUCTURE TECHNOLOGIES

HOMEWORK # 4, PART I

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(You may do this homework in groups of 2 students maximum.)

Topics: Machine Cycle, Registers, and Memory (Chapter 7)

Ex. Suppose that the following instructions are found at memory locations 01 and 02. Suppose that the following data are found at memory 15 and 16.

Address	Instruction	
01	LDA 15	
02	SUB 16	Addresses 01-02 represent the program area
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	Data	
15	20	Addresses 15-16 represent the data area
16	6	

Show the contents of the PC, MAR, MDR, IR, and A registers as each step of the fetch-execute cycle is performed for instructions at addresses 01 and 02. Note that you have a sequence of two instructions. The 5 steps in the second instruction SUB 16 will gradually replace the contents of the registers set by the first instruction.

The machine cycle for the LDA instruction that is in the lecture notes for Chapter 7 and that we discussed on Panopto and MS Teams would be helpful. Also, look at the solution to Assignment One in Small Group Activity #4.

Instruction: 01 LDA 15

Steps in the machine cycle	PC	MAR	MDR	IR	A
1. PC → MAR	01	01	LDA 15	?	?
2. MDR → IR	01	01	LDA 15	LDA 15	?
3. IR[addr] → MAR	01	15	20	LDA 15	?
4. MDR → A	01	15	20	LDA 15	20
5. PC + 1 → PC	02	15	20	LDA 15	20

Instruction: 02 SUB 16

Steps in the machine cycle	PC	MAR	MDR	IR	A
1. PC → MAR	02	02	SUB 16	LDA 15	20
2. MDR → IR	02	02	SUB 16	SUB 16	20
3. IR[addr] → MAR	02	16	6	SUB 16	20
4. A - MDR → A	02	16	6	SUB 16	14
5. PC + 1 → PC	03	16	6	SUB 16	14