**CIS 350 – INFRASTRUCTURE TECHNOLOGIES**

**HOMEWORK # 4, PART I**

Name(s): Regis Wilson

(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 31 and 32. Suppose that the following data are found at memory 45 and 46.

Address Instruction

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31 LDA 45

32 ADD 46 Addresses 31-32 represent the program area

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Data

45 90 Addresses 45-46 represent the data area

46 20

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 31 and 32. Note that you have a sequence of two instructions. The 5 steps in the second instruction ADD 46 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 Assignment One in Small Group Activity #4.

Instruction: 31 LDA 45

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| --- | --- | --- | --- | --- | --- |
| Steps in the machine cycle | PC | MAR | MDR | IR | A |
| 1. PC → MAR | 31 | 31 | LDA 45 | ? | ? |
| 2. MDR → IR | 31 | 31 | LDA 45 | LDA 45 | ? |
| 3. IR[addr] → MAR | 31 | 45 | 90 | LDA 45 | ? |
| 4. MDR → A | 31 | 45 | 90 | LDA 45 | 90 |
| 5. PC+1 → PC | 32 | 45 | 90 | LDA 45 | 90 |

Instruction: 32 ADD 46

|  |  |  |  |  |  |
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| Steps in the machine cycle | PC | MAR | MDR | IR | A |
| 1. PC → MAR | 32 | 32 | ADD 46 | ? | ? |
| 2. MDR → IR | 32 | 32 | ADD 46 | ADD 46 | ? |
| 3. IR[addr] → MAR | 32 | 46 | 20 | ADD 46 | ? |
| 4. A+MDR → A | 32 | 46 | 20 | ADD 46 | 110 |
| 5. PC+1 → PC | 33 | 46 | 20 | ADD 46 | 110 |