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## Assignment 2

#### Question 1

For the following computer architecture fetch-execute cycles, assume opcode for Load is 1, opcode for add is 5, and opcode for store is 2

Memory   CPU Registers   3 0 0 PC   AC	Memory 300 1 9 4 0 301 5 9 4 1
302 2 9 4 1 1 9 4 0 IR 940 0 0 0 3 941 0 0 0 2	302 2 9 4 1 940 0 0 0 0 3 941 0 0 0 2
Step 1	Step 2
Memory CPU Registers  300 1 9 4 0 301 5 9 4 1 302 2 9 4 1  REGISTERS  3 0 1 PC 0 0 0 3 AC 5 9 4 1 IR	Memory 300 1 9 4 0 301 5 9 4 1 302 2 9 4 1 CPU Registers 3 0 1 PC 0 0 0 5 AC 5 9 4 1 R
940 0 0 0 3 941 0 0 0 2	940 0 0 0 3 941 0 0 0 2
Step 3	Step 4
Memory   CPU Registers   3 0 2 PC   0 0 0 5 AC   2 9 4 1   IR	Memory 300 1 9 4 0 301 5 9 4 1 302 2 9 4 1 IR
940 0 0 0 3 941 0 0 0 2 Step 5	940 0 0 0 3 941 0 0 0 5

If the 3<sup>rd</sup> line in the program with content "2941" in all steps is changed to "5941" Explain how this would change register values in step 5 and step 6

In  $3^{rd}$  line the meaning of the command will be add number 2 in location 941 to accumulator, in step 5 it will be the same because it is fetch, in step 6, AC will contain 5+2=7

#### Question 2

Write down the micro steps for the following instructions

# Load A

- » Move A into MAR
- » Send read signal to Memory
- » Move data from MDR to one of the micro processor registers

## Add B,A

- » Move B to MAR
- Send a read signal
- » Move B to the ALU input, send add bits to the ALU
- » Move output through accumulator to one of CPU registers

- » Move A to MAR
- » Send a read signal
- » Move A to the ALU input, send add bits to the ALU
- » Move output through accumulator to one of CPU registers

## Write C

- » Move C into MAR
- » Send Write signal to Memory
- » Move data from MDR to the memory location C

# Question 3

Define what is meant by a fetch cycle, and an Execute cycle, list specific operations that happened in it each and what type of data/instructions that happened in side it.

# Question 4

Define what is meant by the following

- 1. Hard wired Computer Board
- 2. Micro coded Computer Board