Written Assignment Unit 5

The CPU performs processing by giving instructions to data stored in memory. Several steps and elements are required to perform processing, and these are described below.

**1. ALU (Arithmetic Logic Unit)**

The ALU is a collection of logic circuits designed to perform arithmetic (addition, subtraction, multiplication, and division) and logical operations (not, and, or, and exclusive-or). "(Tarnoff, 2007), the ALU is the most fundamental element of the CPU. Once the method of computing the desired result is determined, values or commands are sent to the ALU for processing.

**2. Instruction Decoder**

In order to execute a process in the ALU, it is necessary to determine which circuit should perform what operation. Since the signals sent at this time are in machine language, which is difficult for humans to interpret, a comportment is needed to convert them into machine language and select the appropriate circuit. The Instruction Decoder interprets the instructions to read from memory and directs control signals to the ALU. Finally, the result of the process is stored in memory to complete the sequence of operations.

**3. Clock and Program Counter**

Every process inside a computer is carried out in synchronization at regular intervals. The clock is the component that sends this synchronization signal. For example, the first clock reads an instruction, the second decode the instruction, the third executes the process, the fourth write the result, and so on. Of course, the amount of processing that can be done in one clock cycle is fixed, so the format is not as simple as in the example, but the processing is based on the clock signal.

The PC is the register that contains the address of the next instruction to be fetched, as explained in Nisan, N., & Schocken, S. (2005), the program counterpoints to the memory address of the next instruction to be executed. In the case of a branch operation, after the branch condition is determined, the program counter is updated to fetch the instruction to be branched.

**4. Control Codes**

ALUs are designed to perform a variety of operations. Therefore, it is necessary to determine which arithmetic circuit is to be used in this process. The signals sent for this purpose are Control Codes. For example, when 8 instructions are implemented in the ALU, it is necessary to provide a 3-bit control signal to switch between operations.

**5. Control Unit**

"The control unit is the main component that directs the system operations by sending control signals to the datapath. These signals control the ﬂow of data within the CPU and between the CPU and external units such as memory and I / O. Control buses generally carry signals between the control unit and other computer components in a clock-driven manner.” (Berger, 2006), as explained, the control unit is the component that oversees the flow of data inside the CPU. The timing of processing controlled by the clock must be supervised and managed by some component. For this purpose, the Control Unit sends control signals to control the timing of processing.

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References

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Nisan, N., & Schocken, S. (2005). The elements of computing systems. MIT Press. Retrived from <http://f.javier.io/rep/books/The%20Elements%20of%20Computing%20Systems.pdf>

Berger, A. S. (2006). Hardware and computer organization: The software perspective. Elsevier/Newnes. Retrived from http://ebookcentral.proquest.com/lib/univ-people-ebooks/detail.action?docID=234972.