32-bit CPU Processor Design

Computer Project II

ECEN 3734

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Group #1 is

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Objective

To create a Central Processing Unit (CPU) in VHDL and execute a set of instructions. The CPU has two main parts: the Arithmetic logic unit and a Control unit. The CPU will interact with the primary storage or main memory for instructions and data. The memory only holds data temporarily while the CPU is executing a program. Permanent memory or secondary storage are hard drives. The Control unit tells the circuits of the CPU to execute stored program instruction but does not execute the instructions itself. It communicates with the arithmetic logic unit and memory. The Arithmetic logic unit contains the circuits that perform all of the arithmetic logical operations. The operations of it include, addition, subtraction, multiplication and division. It also makes comparisons between different values. Registers in the arithmetic logic unit are temporary storage areas. The control unit will tell them to accept, hold and transfer data. So the CPU will work together like this. The control unit fetches instructions from the memory. It decides what to do with the instructions. It gives the arithmetic logic unit control to perform operations on the data and stores the result or memory or a register.

Part design and functions

Instructional SRAM: Designed with if statement. When certain conditions are met it turns into a case when statement. It is read only memory so you can't change it internally.

Control Unit: Reads instruction SRAM in machine code and decodes it. Turns registers off and on. The ALU is always on. It will write the output of the ALU to the Data SRAM.

Program Counter: Its a register that increments

ALU: 32 2-bit full adder with 2-bit XOR gates on the inputs. It does addition and subtraction only.

Registers: 32 D flip flops with 8-1 multiplexor.

Data SRAM:

Tasks

Task 1: it works. it does the do stuff yes

Task 2:

Task 3:

Task 4: