

**CS 371**  
**Assignment #8**  
**ROM**

Due 11/30/09, in class

The goal of this assignment is to encode a simple program and then build a ‘ROM’ to hold the encoded program. All instructions are 8 bits and have the following format:

OpCode<sub>1</sub> OpCode<sub>0</sub>    Target    B-Source    Value<sub>3</sub> Value<sub>2</sub> Value<sub>1</sub> Value<sub>0</sub>

- 1) The opcode bits (*i.e.*, function select OpCode<sub>1</sub> OpCode<sub>0</sub>) have the following meaning.

OpCode	Name	Description
00	CMP	compare Target and B-source (Target is not updated)
01	JE	jump equal (not used for this assignment)
10	MOV	move B-source into Target, <i>i.e.</i> , Target = B-source
11	ADD	add B-source and Target, <i>i.e.</i> , Target = Target + B-source

- 2) Target determines the target register (the register written to) as follows:

Target	target register
0	R0
1	R1

- 3) B-Source selects the source of the ALU’s B input, which can be either the B output of the register file or the value component of the instruction.

B-Source	ALU’s B input receives
0	Value
1	Register R1                      (extra credit use Value <sub>0</sub> as a register select)

- 4) Finally, Value is a 4 bit constant value.

Using the above format, encode the program *P*

```
mov R0, 10
mov R1, 4
add R0, R1
add R1, 5
```

Question *Q*: How many bytes does it take to store the encoded program?

Once you have encoded the program, build a circuit that takes as input two address bits (*A*<sub>1</sub> *A*<sub>0</sub>) and returns the corresponding instruction. For example, given the address 10 the output would be the encoding of add R0, R1. Consider making each instruction a sub-circuit.

**What to hand it**

- 1) A schematic printout of your ROM HB with your name in the title block.
- 2) A well annotated test snap-shot of the test driver.
- 3) An email containing the encoding of Program *P*, the answer to Question *Q*, and your .ms8 files in a zip file attachment.

**Notes**

- 1) You can optionally use Value<sub>0</sub> for the register file’s B select input
- 2) Don’t forget the title block.
- 3) Don’t Panic