Cpr E 281 EC-Lab
ELECTRICAL AND COMPUTER ENGINEERING
IOWA STATE UNIVERSITY

EC Lab Answer Sheet

Name and Student ID:_____ **Lab Section:**___

Date:_____

PRELAB:

Part 1: CPU Scavenger Hunt

Q1. Find the **adder** inside the ALU and answer the following:

- What is the name of this component?
- Is it a ripple-carry or carry lookahead adder?
- Can it also do subtraction?
- What is the size of its two operands in bits?

Q2. Find a 4-to-16 **decoder** and answer the following:

- What is the name of this component?
- Does it have an enable input?
- What are the names of its outputs 4 and 6?
- Can you guess what is its function in this CPU?

Q3. Find a **shifter circuit** and answer the following:

- What is the name of this component?
- What is the size of the input in bits?
- What happens to the most significant bit on shift left?
- What happens to the least significant bit on shift right?

Q4. Find the **program counter** and answer the following:

- What is the name of this component?
- What is the size of the output bus in bits?
- How many control lines does it have?
- What type of high-level circuit does it implement?

Q5. Find a **register file** with exactly 4 registers and answer the following:

- What is the name of this component?
- What is the size of each register in bits?
- What type of Flip-Flops are used to construct each register?
- The contents of how many registers can be read at the same time?

Q6. Find two **clock dividers** and answer the following:

- How are they implemented?
- They slow down the clock by a factor of X and Y. What are X and Y?

Q7. Find the **multiplexor** that sits after the ALU and takes the output of the ALU as one of its inputs. Then, answer the following:

- What is the name of this component?
- Where does the other input come from?
- What is the size of each input in bits?
- How many select lines does it have in bits?

Q8. Find the circuit that outputs the signal **DMEM_WRITE_ENABLE** and then answer the following:

- In which block is this circuit located?
- What is the Boolean expression for this signal?

Q9. Examine the **DMEM** box and answer the following:

- What are the names of the control lines for this box?
- What high-level component is used to implement the data memory?
- What is the size of the data memory in bytes?

Q10. Find the **flags register** and answer the following:

- How many flags does it store?
- What are the names of these flags?

TA Initials: _____

Part 2: Play a game of PONG!

Draw the output shown on the four 7-semgment indicators when the game is over.

TA Initials: _____

LAB:

Can you Play the Game well?
Demonstrate to the TA that you can play the game. TA Initials: _____