**Name:**

Note: Please post your homework to ICS232 D2L on or before the due date.

**Chapter 4 – MARIE: An Introduction to a Simple Computer**

**Essential Terms and Concepts**

4. Where are registers located and what are the different types?

10. What is a bus cycle?

17. Explain the difference between memory-mapped I/O and instruction-based I/O.

20. Why is address alignment important?

21. List and explain the two types of memory interleaving and the differences between them.

33. How does interrupt driven I/O work?

38. What is a stack? Why is it important for programming?

**Exercises**

1. What are the main functions of the CPU?

2. How is the ALU related to the CPU? What are its main functions?

5. How many bits are required to address a 4M × 16 bits main memory if

a) Main memory is byte-addressable?

b) Main memory is word-addressable?

13. A digital computer has a memory unit with 24 bits per word. The instruction set consists of 150 different operations. All instructions have an operation code part (opcode) and an address part (allowing for only one address). Each instruction is stored in one word of memory.

a) How many bits are needed for the opcode?

b) How many bits are left for the address part of the instruction?

c) What is the maximum allowable size for memory?

d) What is the largest unsigned binary number that can be accommodated in one word of memory?

21. Explain why, in MARIE, the MAR is only 12 bits wide while the AC is 16 bits wide.

Hint: Consider the difference between data and addresses

27. Write the assembly language equivalent of the following MARIE machine language

instructions:

a) 0111000000000000

b) 1011001100110000

c) 0100111101001111

29. Write the following code segment in MARIE's assembly language:

if (X > 1) {

Y = X + X;

X = 0;

}

Y = Y + 1;

33. Write the following code segment in MARIE assembly language:

X = 1;

while (X < 10) {

X = X + 1;

}

**Prepare for next class by continuing to read Chapter 4 – MARIE: An Introduction to a Simple Computer.**

**Start working on Your Group Project**

**Start working on Project 1**