ISE 218: Fundamentals of Information Technology

Stony Brook University at Anhui University

Homework #3

Fall 2023

Assignment Due: Sep 28, 2023

Neatly write or type your answers to the following problems on a separate sheet of paper and submit a digital copy. For mathematical calculations you must show all work to receive full credit and simplify your answers as much as possible, giving a single number as your answer.

For all questions involving sizes, you should use 2-based units of size. For example, 1 KB = 2^{10} bytes, not 10^3 bytes.

1. [6 pts] How many bits are required to address a 4M × 64 main memory if:
    a. main memory is byte-addressable?
    b. main memory is word-addressable?

2. [9 pts] Suppose that an 8G × 32 main memory is built using 256M × 16 RAM chips and memory is word addressable.
    a. How many RAM chips are necessary?
    b. How many address bits are needed to address a particular memory cell in a RAM chip?
    c. How many address bits are needed for all memory?

3. [3] Write 3 MARIE Instruction set for Load, Store, and Halt in binary.

4. [6] Write 2 sets of micro-operations using register transfer language (RTL) for Sub and Add.

5. [7] Explain SKIPCOND (400), how SKIPCOND is related with the AC register?

6. [5] In MARIE Architecture how ‘fetch, decode, get opened and execute’ works for Sub operation.

7. [4] What is the difference between MAR and MBR?

8. [3] What is the difference among data lines, control lines and address lines?

9. [2] What is the difference between Maskable and Non-Maskable interrupts?