Study Guide for Midterm Exam – CDA 3100 Computer Organization

1, Introduction

(1) How to calculate various simple measures of computer performance, including conversion between clock rate and clock period, CPU time, and Amdahl's Law.
(2) How to compare the computer performance with the consideration of CPU time.

2, Number representations

(1) Number representations in base 2 and base 16
(2) Number conversion among different bases (base 10, 2, and 16)
(3) Two's complement representation for signed number
(4) Binary addition and subtraction for signed number
(5) Overflow detection
(6) Difference between sign extension and zero extension
(7) Floating number representation in IEEE 754 FPS (Single precision only for the midterm exam)
(8) IEEE 754 FPS pattern value determination from a hexadecimal number

3, Assembly 1

(1) Know the usage of 32 MIPS integer registers (Slide set Assembly 1, Page 14)
(2) Know the basic MIPS assembly programming (Slide set Assembly 1, Page 19)
(3) Know how to use a system call if a description is given (including the system call code, arguments, and result); in other words, you do not need to remember or write on your sheet the system call numbers (Slide set Assembly 1, Page 22)
(4) Know the meanings of the instructions in Fig. 2.1 on textbook
(5) Know how to index array element with both a constant value and a variable value
(6) Know how to implement if-then-else statements in MIPS
(7) Know how to implement a for loop in MIPS
(8) Know how to implement a while loop in MIPS

4, Assembly 2

(1) Floating-point instructions
(2) Function usage in MIPS assembly
    a. Know what a caller needs to do before calling a function
    b. Know how a function call is implemented in MIPS
    c. Know exactly what instruction jal does
    d. Know what a callee needs to do before it starts its computation
    e. Know what a callee needs to do before it returns to the calling function
    f. Know how to return values to the calling function
    g. Know exactly what instruction jr does
(3) MIPS encoding: R format, I format, J format instruction format
(4) Given opcode, how to encode an instruction (only need to know the instructions in Fig. 2.1 in textbook)
(5) How to compute and encode the offset in a conditional branch instruction (bne and beq)
(6) How to compute the target address in J format

5, Digital design 1

(1) Know what the functions of logic gates (And, Or, Not, Xor, Nor) and their symbol representation
(2) Know combination logic blocks (decoder, multiplexor) and their usage
(3) Know how to get the output in the truth table given a requirement or a logic block
(4) Know how to obtain logic equations given a truth table
(5) Know how to do the logic minimization
    a. Boolean algebra, K-maps

6, Digital design 2

(1) Given a 1-bit ALU or a 32-bit ALU, know how to perform the following operations in it
    a. And, or, addition, subtraction, slt, and beq