

COE 205 Computer Organization & Assembly Language – Fall 2004

Assignment 1: Introduction to Computer Organization and Data Representation

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Due Date: Monday, September 27, 2004

- Q1. Describe the functionality of the Program Counter (PC), the Instruction Register (IR), the Memory Address Register (MAR), and the Memory Data Register (MDR).
- Q2. List and briefly describe the tools used by the assembly language programmer.
- Q3. a) Define the term *bus*.
b) Why are buses used in computers?
- Q4. Represent the following numbers in binary, octal, and hexadecimal.
a) 2345.5
b) 149.625
- Q5. Perform the following arithmetic operations using the designated bases and verify your result by converting the numbers and performing the operation in decimal:
a) $(10110110)_2 + (10111)_2$
b) $(713)_8 + (167)_8$
c) $(C0E)_{16} + (13B)_{16}$
- Q6. Express the following numbers in sign-magnitude, 1's complement, and 2's complement notations, using 8-bit representation:
a) - 101
b) - 45
- Q7. Perform the following operations twice, once for a sign-magnitude notation and once for 2's complement notation, assuming 4-bit representation of numbers. Indicate in your answer when an overflow occurs:
a) $0101 + 1111$
b) $1011 - 0111$
- Q8. Using 8-bit registers, give the following in both binary and decimal:
a) The maximum unsigned number that can be stored.
b) The smallest negative number and the largest positive number that can be stored using sign-magnitude notation.
c) The smallest negative number and the largest positive number that can be stored using 2's complement notation.
- Q9. If you type the string "I Love COE 205" on your keyboard, what byte sequence is sent to the computer using ASCII codes, with the 8th bit being an even parity bit?