COE 205, Term 101

Computer Organization & Assembly Programming

HW# 1

Q.1. What is the ISA (instruction set architecture) of a computer?

Q.2. Briefly describe the main functionality of the program counter register (PC), the instruction register (IR), and the fetch-execute process in a computer.

Q.3. Describe two advantages for programming in assembly and two advantages for programming in a high-level language.

Q.4. Represent the following numbers in binary, octal, and hexadecimal. Use as many bits as needed, and approximate the fraction up to 3 digits:

(i) 250.375

(ii) 4444.4

Q.5. Perform the following arithmetic operations using the designated bases and verify your result by converting the numbers and performing the operation in decimal:

(i) $(10E)_{16} + (13F)_{16}$

(ii) $(1E)_{16} * (10)_{16}$

(iii) $(1101)_2 * (1000)_2$

Q.6. Express the following numbers in sign-magnitude, 1`s complement, and 2`s complement notations, assuming 8-bit representation:

(i) -119

(ii) -55

Q.7. Show how the decimal integer -120 would be represented in 2`s complement notation using:

(i) 8 bits

(ii) 16 bits

Q.8. 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:

(i) 0101 + 1111

(ii) 1011 - 0111

Q.9. A microcontroller uses 8-bit registers. Give the following in both binary and decimal:

(i) The maximum unsigned number that can be stored.

(ii) The smallest (negative) number and the largest (positive) number that can be stored using the sign-magnitude notation.

(iii) The smallest (negative) number and the largest (positive) number that can be stored using the 2`s complement notation.

Q.10. If you type the phrase COE205 on your keyboard, what is the binary sequence sent to the computer using 8-bit ASCII with the 8^{th} bit being an even parity bit.

Q.11. Translate the following secret message, which has been encoded in ASCII as: 41 74 74 61 63 6B 20 61 74 20 44 61 77 6E.

Q.12. Suppose that a byte contains the ASCII code of a decimal digit; that is `0` to `9`. What hex number should be subtracted from the byte to convert it to the numerical form of the characters?