

## COE 301/ICS 233, Term 171

### Computer Architecture & Assembly Language

#### HW# 1

- Q.1.** Briefly describe the main functionality of the program counter register (PC), the instruction register (IR), and the fetch-execute process in a computer.
- Q.2.** Describe two advantages for programming in assembly and two advantages for programming in a high-level language.
- Q.3.** Given a magnetic disk with the following properties: Rotation speed = 7200 RPM (rotations per minute), Average seek = 8 ms, Sector = 512 bytes, Track = 200 sectors. Calculate the following:
- (i) Time of one rotation (in milliseconds).
  - (ii) Average time to access a block of 32 consecutive sectors.
- Q.4.** Represent the following numbers in binary and hexadecimal. Use as many bits as needed, and approximate the fraction up to 3 digits:
- (i) 250.375
  - (ii) 4444.4
- Q.5.** Express the following numbers in sign-magnitude, 1's complement, and 2's complement notations, assuming 8-bit representation:
- (i) -119
  - (ii) -55
- Q.6.** Show how the decimal integer -120 would be represented in 2's complement notation using:
- (i) 8 bits
  - (ii) 16 bits
- Q.7.** Perform the following operations assuming 8-bit 2's complement representation of numbers. Indicate in your answer when an overflow occurs:
- (i)  $01010011 + 11111111$
  - (ii)  $10110000 - 01110110$
  - (iii)  $AF + FF$
  - (iv)  $AF - 70$

**Q.8.** 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.9.** If you type the phrase ICS233 on your keyboard, what is the binary sequence sent to the computer using 8-bit ASCII with the 8<sup>th</sup> bit being an even parity bit.

**Q.10.** 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?