

COE 301/ICS 233, Term 172

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 8th 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?