CPE2323: Computer Architecture and Organization

Assignment # 1

Due Date: 16th Oct 2026 11:00 AM

Part A: Number Base Conversions

Convert the following. Show all steps.

1. $(11010110)_2$ → decimal, octal, hexadecimal
2. $(473)_8$ → binary, decimal
3. $(2F5A)_{16}$ → binary, decimal
4. $(0.6875)_{10}$ → binary (fractional)
5. $(-45)_{10}$ → 8-bit two's complement

Part B: Arithmetic Operations

Perform the following operations in **8-bit two's complement**. Show all steps and indicate whether overflow occurs.

1. (+37) + (+52)
2. (+85) + (-40)
3. (-70) - (+30)
4. (-128) - 1
5. Multiply (+12) × (-5) using shift-and-add

Part C: IEEE 754 Single Precision

1. Represent -12.75 in **IEEE 754 single-precision** format. Show sign, exponent (biased), and mantissa.
2. Decode the following IEEE 754 single-precision value into decimal: 0xC2A80000

Part D: Conceptual Questions

1. Why is two's complement preferred over sign-magnitude for integer representation? Give two reasons.
2. What is the **hidden (implicit) bit** in IEEE 754 floating point, and why is it used?