

APPLIED COMPUTER SCIENCE

ACS-2906-002

Computer Architecture and System Software

Winter 2025

Laboratory 3

Motivation

The goal of this laboratory is to reinforce integer arithmetic in signed two's complement binary representation, as well as, conversion of fractional binary numbers. No calculators are allowed to solve these problems. You must perform all arithmetic operations by hand and show your work to receive full marks. You do not need to show your work for decimal to binary conversions in questions 1 and 2.

Questions

1) Perform the following in binary using 8-bit signed two's complement signed binary representation. Remember to truncate when necessary. **(0.5 marks each)**

- a. $23 + 17$
- b. $101 + 15$
- c. $-90 + 42$
- d. $-13 + 19$
- e. $29 - 70$
- f. $-110 - 29$
- g. $-71 - 17$

2) Perform the following in binary using 8-bit signed two's complement signed binary representation. Remember to truncate when necessary. **(1 mark each)**

- a. 21×4
- b. 13×12

c. -32×3

d. 56×-1

3) Convert the following to decimal. (0.5 marks each))

a. 10 1001.011

b. 11 0100.101

c. 11 1111.111

4) Convert the following to a fractional binary number. (0.5 marks each))

a. 67.3125

b. 41.5625

Submission instructions

Include your name and student number in all files. Submit your solution to Nexus. **Students that do not follow these instructions will lose 2 marks. Late submissions will not be accepted. NO EXCEPTIONS**