Homework #2 **4190.308 Computer Architecture**

Due Date: Wednesday, March 22, 2023 **Sample Solution**

Submission: electronically on eTL (scan & upload)

Question 1

Hexadecimal, decimal and binary notations

Perform the following number conversions and calculations.

(a) 0x87cb31 in binary notation

0b00000000100001111100101100110000

(b) 0b11001101111010010101010 in hexadecimal notation

0x19bd2a

(c) 188 in binary notation

0b00000000000000000000000010111110

(d) 0x1234 + 0x8e in hexadecimal notation.

0x12c2

Question 2

Logical Operations in C

Assume x, y and z have the values 0xB5D2, 0x7E3A and 0x5ABC, respectively. In the following table, fill in the blanks indicating the values of the different C expressions (use hexadecimal notation).

Expression	Value	Expression	Value
x & y	0x3412	x && y	**0x0001**
x | y	**0xfffa**	x || y	**0x0001**
x | (y & z)	**0xfffa**	x || (y && y)	**0x0001**
~x | ~y	**0xcbed**	!x || !y	**0x0000**
x & !y	**0x0000**	x && ~y	**0x0001**

Question 3

Integer representations

(a) Write down the bit pattern of `int i = -4190308`

0b11111111110000000000011111001110

(b) Write down the bit pattern of `short s = -5000 >> 8`

0b111111111110110

(c) Compute `unsigned char c = 144 + 127`

15

(d) Compute `signed char c = -100 – 44`

112

Question 4

Fixed-point representations

(a) Represent 3.141526535 in 3.4 fixed-point notation. **$11.0010_{(2)}$**

$3.141526535 \times 2^4 = 50.26442456$

2 | 50
2 | 25 ⋯ 0
2 | 12 ⋯ 1
2 | 6 ⋯ 0
2 | 3 ⋯ 0
1 ⋯ 1

then move the decimal point from $110010_{(2)}$ to $11.0010_{(2)}$

(b) Compute 1.0625 * 2.375 in 3.4 fixed-point notation.

$(1.0625 \times 2.375) \times 2^4 = 40.375$

2 | 40
2 | 20 ⋯ 0
2 | 10 ⋯ 0
2 | 5 ⋯ 0
2 | 2 ⋯ 1
1 ⋯ 0

then move the decimal point from $101000_{(2)}$ to $10.1000_{(2)}$