Yousef Jarrar

CSE 401 – Dr. Gomez

Homework 3

**3.8**

*Assume 185 and 122 are signed 8-bit decimal integers stored in*

*sign-magnitude format. Calculate 185 - 122. Is there overflow, underflow, or*

*neither?*

The sign-magnitude representation for these two given 8-bit decimal integers are:

(185)­10=(1011 1001)2

= -57

Similarly,

(122)10 = (0111 1010)2

= 122

In sign-magnitude form, the result of: - A – (+B) = - (A + B)

Therefore,

185-122 = -57 – (122)

= -57 + 122

The calculation for 185 – 122 is:

0111001 (57)

+

1111010 (122)

10110011

Neglecting the 8th bit, the result is: (011011)2 = (51)10

The sign of the operation will be negative.

**Thus, the calculation 185 – 122 = (-57) – (122)** **results in -51**.

Since, there was a carry generated during the addition, hence, an **overflow** occurs in the operation.

**3.24**

*Write down the binary representation of the decimal number 63.25 assuming the IEEE 754 double precision format.*

Double precision uses two 32-bit words for representing a floating-point value. The numbers are 53 bit long in double precision (1 + 52).

Following steps must be taken for converting 63.25 from base 10 to IEEE 754 double precision:

• Convert 63 to base 2 which is (111111)2

• Convert (.25) to base 2 which is (.01)2

• Add both:

(63) + (.25) = (111111) + (0.01)

= (1111111.01)2

Writing it to binary scientific notation:

63.25 x 10 0 = (111111.01) \* (20)

Normalize and move the binary point 5 times to the left

(1.1111101) \* (25)

This number is written in IEEE 754 Double Precision:

(-1)s \* (1+Fraction) \* 2 (exponent – 1023)

= (-1)0 \* ( 1 + (.1111 1010 0000) ) \* 2(1028 – 1023)

5 is converted to the correct bias; Since the bias is 1023, we add 5 to it. Which gives us 1028. Binary form of 1028 is: 100000001002

The Binary Representation assuming IEEE 754 double precision is: 0 1000000100 1111 1010 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000