COSC 290.002

Class Exercises #3

1. Given a tiny computer that has a word size of 6 bits, what the smallest negative numbers and the largest positive numbers that this computer can represent in each of the following representations?

Smallest negative no. Largest positive no.

(In binary) (in decimal) (in binary) (in decimal)

* 1. Singed magnitude \_\_\_\_\_\_\_\_2 = \_\_\_\_\_\_\_10 \_\_\_\_\_\_\_2 = \_\_\_\_\_\_\_\_10
  2. One’s complement \_\_\_\_\_\_\_\_2 = \_\_\_\_\_\_\_10  \_\_\_\_\_\_\_2 = \_\_\_\_\_\_\_\_10
  3. Two’s complement \_\_\_\_\_\_\_\_2 = \_\_\_\_\_\_\_10 \_\_\_\_\_\_\_2 = \_\_\_\_\_\_\_\_10
  4. Excess—31 \_\_\_\_\_\_\_\_2 = \_\_\_\_\_\_\_10 \_\_\_\_\_\_\_2 = \_\_\_\_\_\_\_\_10

1. Add the following signed binary numbers as shown using one’s complement arithmetic and two’s complement arithmetic
   1. 0 1 1 0 1 1 1 1 b. 1 1 1 0 1 1 0 1 c. 1 1 1 1 1 1 1 0

+ 1 1 0 1 1 0 0 1 + 1 1 0 1 0 0 0 1 + 1 0 1 1 0 1 0 1

OC \_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

TC \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. 0 1 1 0 1 1 1 1 e. 1 1 1 0 1 1 0 1 f. 1 0 0 1 1 1 1 0

- 1 1 1 0 0 0 1 1 - 1 1 1 1 0 1 0 1 - 0 0 0 1 0 1 1 1

OC \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

TC \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Using arithmetic shifting as shown in 8 bits storage using one’s and two’s complement, perform the following:

OC TC

* 1. 0 0 0 0 1 1 0 1 X 22  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  2. 0 0 1 1 1 1 0 1 X 2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  3. 1 1 1 1 0 1 1 0 X 23 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  4. 0 0 1 0 1 0 1 1 / 22  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  5. 1 1 1 1 0 1 0 0 / 2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Perform the following binary multiplications using Booth’s algorithm, assuming signed two’s complement integers:
   1. 01110 b. 10100010

X 01111 x 11000000