1. Represent the following decimal numbers in twos complements using 8bits: 52, -52

 52: 00110100

-52: 00110100

    11001011

+   1

——

=   11001100

2. Assume numbers are represented in 8-bit 2's complement representation. Show the calculation of the followings:

1) 5 + 10   2) -5 + 10   3) 5 – 10   4) -5 -10

5: 00000101   10: 00001010   -5: 11111011   -10: 11110110

    1) 5 + 10: 00000101 + 00001010 = 00001111

    2) -5 + 10: 11111011 + 00001010 = (1)00000101 (carry 발생)

    3) 5 – 10: 00000101 + 11110110 = 11111011

    4) -5 – 10: 11111011 + 11110110 = (1)11110001 (carry 발생)

3. Express the following numbers in IEEE 32bit floating-point format

    1) -1.5: -1.1 * 2^0

    부호부: 1

    지수부: 지수는 0이므로 bias인 127에 0을 더하면 127이고 127을 2진수로 변한 값이 지수부가 된다.

    가수부: 1.1

    따라서 1 01111111 10000000000000000000000

    2) -1/32: -0.03125 = -0.00001 = -1.0 * 2^-5

    부호부: 0

    지수부: 지수는 -5이므로 bias인 127에 -5를 더하면 122이고 122를 2진수로 변한 값이

지수부가 된다.

가수부: -1.0

따라서 1 01111010 00000000000000000000000

4. What is the equivalent decimal value of the following IEEE 32bit floating-point representation?

1) 1 10000010 00100000000000000000000

부호부: 1

지수부: 130

가수부: 1.001

-1.001 * 2^3 = -1001 = -9

2) 0 01111110 11000000000000000000000

부호부: 0

지수부: 126

가수부: 1.11

1.11 * 2^-1 = 0.111 = 0.875

5. A given processor has words of 16bits. What is the smallest and largest integer that can be represented in the following representations:

1) unsigned   smallest: 0   largest: 2^16

2) sign-magnitude smallest: -(2^15)+1   largest: (2^15) -1

3) 2's complement smallest: -2^15   largest: (2^15) -1

6. Do the calculation of adding -64 and -64. Assume numbers are represented in 8-bit 2's complement representation. Show the following flags after the addition.

-64: 11000000

-64 + (-64) = 10000000

1) C: sign bit에서 1이 올라가므로 carry값은 1이다

2) O: 8비트의 범위는 -128~127이므로 overflow가 발생하지 않았으므로 0이다.

3) S: sign bit값은 -128로 음수이므로 1이다.

4) Z: 산술 연산 값이 0이 아니므로 0이다

7.List and explain five important fundamental issues in designing Instruction Set.

Operation repertoire: how many and which operations to provide and how complex operations should be

Data types: various types of data upon which operations are performed

Instruction format: instruction length in bits. Number of addresses, size of various field, etc

Registers: number of processor registers that can be referenced by instructions and their use

Addressing: the mode or modes by which the address of and operand is specified

8. List three possible places for storing the return address for a procedure.

1. Registers

2. Start of called procedure

3. Top of stack

9. What is the difference between an arithmetic right shift and a logical right shift?

Arithmetic right shift는 맨 왼쪽의 값으로, 기존의 부호를 다루는 sign 값을 그래도 갖으면서 오른쪽으로 1칸씩 이동한다. -> 부호 비트가 보존된다

Logical right shift는 맨 왼쪽의 값은 무조건 0을 넣고 오른쪽으로 1칸씩 이동한다. -> 부호 비트가 보존되지 않는다