CSE2312-001 (Fall 2020)
Homework #1

Notes:
All numbers are in base-10 unless otherwise noted.
If part of a problem is not solvable, explain why in the answer area.
Print out the form and handwrite your answers in the spaces below.
Submit a copy with handwritten answers to Canvas before 11:59:00pm on September 17, 2020.

1. Convert the following numbers between bases:

a. 10111011 (base-2) = _____ (base-10)

b. 10111011 (base-2) = _____ (base-16)

c. 0x5249 = 5249 (base-16) = _____(base-2)

d. 0x5249 = 5249 (base-16) = _____(base-10)

e. 16383 = _____ (base-2)

f. 4095 = _____ (base-16)

2. What is the range of the following C99 variable types assuming the processor uses two's compliment arithmetic for signed number representation?

a. uint8_t _____ to _____

b. uint16_t _____ to _____

c. uint32_t _____ to _____

d. int8_t _____ to _____

e. int16_t _____ to _____

f. int32_t _____ to _____

3. Write the binary representation of the C99 variables given below.
Example: for uint8_t x = 13, the answer would be answer is: 0000 1101 (base-2)

a. uint8_t x = 27;

b. uint8_t x = 122;

c. uint8_t x = 215;

d. uint8_t x = 40;

e. int8_t x = -40;

f. int8_t x = -103;

g. int8_t x = 103;

h. uint16_t x = 13000;

i. int16_t x = 13000;

j. int16_t x = -13000;

k. uint32_t x = 262144;

l. int32_t x = -50;

m. int32_t x = 50;

4. Write the status of the Carry (C), Zero (Z), and Sign (S) flags after an 8-bit ALU performs an ADD operation on the following 8-bit arguments (a and b):

Hint: Remember that the ALU just sees bits and does not know if the numbers represent signed or unsigned numbers.

a. uint8_t a = 91, uint8_t b = 23

b. uint8_t a = 102, uint8_t b = 3

c. int8_t a = 32, int8_t b = -22

d. int8_t a = -32, int8_t b = 22

e. int8_t a = 100, int8_t b = -100

f. int8_t a = -130, int8_t b = 100

g. int8_t a = -32, int8_t b = 72

5. Show the status of the Zero (Z), and Sign (S) flags and the result after each operation. Note the bases carefully.

a. arg1 = 33, arg2 = 2; result = arg1 OR arg2

b. arg1 = 0x23, arg2 = 0x14; result = arg1 OR arg2

c. arg1 = 0x2C, arg2 = 0x78; result = arg1 AND arg2

d. arg1 = 0xA5; result = NOT arg1

e. arg1 = 29; result = NEG arg1

6. For each of the following operations, show the value of R0 in base-10 unsigned representation (e.g., If R0 = 16384, then R0 LSR #1 = 8192).

For these questions, assume that the register R0 contains an unsigned 32-bit integer (e.g., uint32_t) with a value of 2048 (0x00000800).

a. R0 LSR #8: _____

b. R0 LSR #9: _____

c. R0 LSR #10: _____

d. R0 LSR #11: _____

e. R0 LSR #12: _____

f. R0 LSL #20: _____

g. R0 LSL #21: _____

h. R0 LSL #22: _____

i. R0 ASR #8: _____ (abnormal ASR usage)

For these questions, assume that the register R0 contains an unsigned 32-bit integer (e.g., uint32_t) with a value of 3758096384 (0xE0000000).

j. R0 LSL #1: _____

k. R0 LSR #1: _____

l. R0 ASR #1: _____ (abnormal ASR usage)

7. For each of the following operations, show the value of R0 in base-10 signed representation (e.g., If R0 = -64, then R0 ASR #1 = -32).

For these questions, assume that the register R0 contains a signed 32-bit integer (e.g., int32_t) with a value of -4 (0xFFFFFFFC)

a. R0 ASR #2: _____

b. R0 ASR #3: _____

c. R0 ASL #2: _____

d. R0 ASL #3: _____

e. R0 ASL #28: _____

f. R0 ASL #29: _____

g. R0 ASL #30: _____

h. R0 LSR #2: _____ (note abnormal LSR usage)

Assume that the register R0 contains a signed 32-bit integer (e.g., int32_t) with a value of 8 (0x00000008).

i. R0 ASR #3: _____

j. R0 ASR #4: _____

k. R0 ASL #3: _____

l. R0 ASL #4: _____

m. R0 LSR #3: _____ (note abnormal LSR usage)