Computer Science 605.411

Problem Set 3

1. The product of the decimal integers -73 and +539736088 is to be computed. Answer the following questions based on the recoded multiple from Booth's algorithm. You need not show the individual steps involved in calculating the product.
(5) a) How many additions would be needed in generating the product using Booth's algorithm if +539736088 is used as the multiplier?
(5) b) How many additions would be needed in generating the product using Booth's algorithm if -73 is used as the multiplier?
(5) a) How many subtractions would be needed in generating the product using Booth's algorithm if +539736088 is used as the multiplier?
(5) b) How many subtractions would be needed in generating the product using Booth's algorithm if -73 is used as the multiplier?

2. (20) Without using the SPIM simulator, manually generate the MIPS machine code instruction that corresponds to the following assembly language statement:

```
cvt.s.w  $f2,$f6
```

Express your answer as an 8-digit hex number.

3. The speed of light in a vacuum is 186,262 miles/second. Show how this value would be represented in register $8 as a 32-bit two's complement integer and in register $f8 as a 32-bit IEEE 754 standard floating point number. Use 8 hex digits to show the 32-bit pattern in each register.
(20) $8 = _____
(20) $f8 = _____

4. a) (10) Register $23 contains the 32-bit pattern corresponding to the hex value **0x202BB818.** Show the symbolic assembly language instruction that would correspond to this pattern if it is interpreted as a MIPS machine instruction.

b) (10) Suppose that register $23 contains the 32-bit pattern corresponding to the hex value **0x202BB818** and $4 contains the 32-bit pattern for the two's complement representation of the decimal value **550039612**. The following instruction is then executed:

xor $23,$23,$4

Show the symbolic assembly language statement that corresponds to the pattern left in $23 by this xor instruction if the 32-bit result left in $23 is interpreted as a MIPS machine instruction.