SP22 CSCI 113 Assignment 6 due: 03/18 (F)

Practice for computer arithmetic

For all questions, please show your computation clearly.

1. Consider Fig. B.5.12 (from book/lecture note) and explain clearly how ***slt*** instruction is manipulated in the 32-bit ALU.
   Also, explain why control signal values for ***slt*** instruction are '0111'.

2. Consider the unsigned number multiplication hardware that we discussed in class.
   Assume that the hardware is used for unsigned 4-bit number multiplication [0101 * 1110].
   Show the contents of registers for each step of the multiplication using the 2-step multiplication algorithm.

MD	AC	MQ
….	….	….

3. Consider the Booth's algorithm for 2's complement number multiplication.

   (a) Show Booth's recoded number for binary value [1010011101] and justify your answer.

   (b) For [1010 * 0101], i.e., (-6) * 5 in decimal, show the contents of registers for each step.

MD	AC	MQ	MQ_{-1}
….	….	….	

4. Perform the restoring division for [1011 / 0100], i.e., 11 / 4 in decimal, and show the contents of registers for each step. Also show the resulting quotient and remainder in binary numbers.

MD	AC	MQ
….	….	….

5. Perform the non-restoring division for [1011 / 0100], i.e., 11 / 4 in decimal, and show the contents of registers for each step. Also show the resulting quotient and remainder in binary numbers.

MD	AC	MQ
….	….	….

6. Explain briefly how the non-restoring division algorithm achieves higher efficiency than the restoring division algorithm.