

Cpr E 381 Homework 5

1. (10 points) Data Conversion Practice:
 - a. Convert 16384 base 10 to a 16-bit two's complement binary number.
 - b. Convert -1023 base 10 to a 16-bit two's complement binary number.
 - c. Convert -32000 base 10 to a 16-bit two's complement binary number.
 - d. Convert 111111111101111 two's complement base 2 to a decimal number.
 - e. Convert 011111111101111 two's complement base 2 to a decimal number.

2. (10 points) Problem 3.9

3. (10 points) Problem 3.12

4. (10 points) Problem 3.14

5. (20 points)
 - (a) Find the shortest sequence of MIPS instructions to determine if there is a carry out from addition of two registers say \$t3 and \$t4. Place a 0 or 1 in register \$t2 if the carry out is 0 or 1, respectively.

 - (b) Find the shortest sequence of MIPS instructions to perform double precision integer addition. Assume that one 64-bit two's complement number is stored in registers \$t4 and \$t5 and the other one is stored in register \$t6 and \$t7. The sum is placed in register \$t2 and \$t3. Even number registers store most significant parts.

6. (20 points) Hamming distance is a metric used to indicate how different two binary values are. Hamming distance is the number of bits that differ between two values. Consider 1101 and 1011. The Hamming distance is 2 because the two middle bits differ between the two values. The Hamming distance between 0001 and 0000 is 1 because the last bit differs between the two values. Write a MIPS routine to compute the Hamming distance between two 32-bit values. Your routine should use only a single jump or branch instruction. Run your routine in SPIM and test with the decimal values 16299 and -3.

7. (20 points) Perform the following operations by hand showing all work for $X = 0001\ 1010$ and $Y = 1111\ 1100$. Use tabular format for part c and part d.
 - a. $X + Y$
 - b. $X - Y$
 - c. $X * Y$
 - d. X / Y