**CS365 Homework #3 (20 points)**

***Due date: see blackboard assignment.***

1. (6 points) Trace the multiplication hardware (both version 1 and version 2) when multiplying 2 5-bit unsigned numbers 10101 x 01011.
2. Version 1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Iteration | Multiplicand | Multiplier | Product | Action(s) |
| 0 |  |  |  |  |
| 1 |  |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |
| 4 |  |  |  |  |
| 5 |  |  |  |  |

1. Version 2

|  |  |  |  |
| --- | --- | --- | --- |
| Iteration | Multiplicand | Product | Action(s) |
| 0 |  |  |  |
| 1 |  |  |  |
| 2 |  |  |  |
| 3 |  |  |  |
| 4 |  |  |  |
| 5 |  |  |  |

1. (4 points) Show the IEEE 754 binary representation for the following floating-point numbers (single precision only).
   1. -2.75
   2. 20.625
   3. 0.0
   4. -1.0
2. (4 points) Bits have no inherent meaning. Given the bit pattern:

1010 1100 1011 0010 0100 1001 0010 0100

What does it represent respectively, assuming that it is

1. A two’s complement integer
2. An unsigned integer
3. A MIPS instruction
4. A single-precision floating point number in IEEE 754 standard
5. (6 points) Floating point operations.
6. Use decimal (base-10) values (**2.851x101** and **-9.854 x 10-1**) to illustrate the floating-point **addition** algorithm step by step. List the name/action of each step, and illustrate the step using the given value. Your result should have 4 significant digits. (Note: significant points refer to all meaningful digits, not the digits after decimal points. For example, 2.851 has 4 significant digits.)
7. Use the same value as (a) to illustrate the floating-point **multiplication** algorithm step by step. Again, the result should have 4 significant digits.
8. Using binary values **-1.11110011 x 2-3**and **1.10001111 x 22** to illustrate the floating-point **multiplication** algorithm step by step. Leave the result format as the input data.