**Program 1 – Matrix Program Files**

Assumptions: As a group we made assumptions that a matrix is simply 4 values (a1, b1, a2, b2) sent to the registers which will be put into the registers and memory in sequence with each other. For example, if a 2x2 matrix is initialized with values {23 7, 36 99}, they will be put into the memory as 23 at memory location 0, 7 at memory location 1, 36 at memory location 2, and 99 at memory location 3.

Things to note: In our actually assembly and hex program we moved all register values to memory after initializing each array for the sole purpose of proving that our CPU could do this. It is not a necessary step and thus the C code will not show that step. Also, after both matrix 1 and matrix 2 are initialized and added to memory, we moved all of the values from the memory back into the registers, again for the sole reason of proving that our CPU could do that.

C Program:

// initialize the first 2x2 matrix

int a1 = 3;

int a2 = 2;

int a3 = 6;

int a4 = 1;

// after this step memory will read as: 3 2 6 1

// initialize the second 2x2 matrix

int b1 = 4;

int b2 = 6;

int b3 = 3;

int b4 = 9;

// after this step memory will read as: 3 2 6 1 4 6 3 9

// create the third matrix

int c1 = a1+b1; // 7

int c2 = a2+b2; // 8

int c3 = a3+b3; // 9

int c4 = a4+b4; // 10 (a)

// after this step memory will read as: 3 2 6 1 4 6 3 9 7 8 9 a

Assembly code:

irmov 3 0

irmov 2 1

irmov 6 2

irmov 1 3

rmmov 0 0

rmmov 1 1

rmmov 2 2

rmmov 3 3

irmov 4 4

irmov 6 5

irmov 3 6

irmov 9 7

rmmov 4 4

rmmov 5 5

rmmov 6 6

rmmov 7 7

mrmov 0 4

mrmov 1 5

mrmov 2 6

mrmov 3 7

mrmov 0 4

mrmov 5 1

mrmov 6 2

mrmov 7 3

add 0 4

add 1 5

add 2 6

add 3 7

rmmov 4 8

rmmov 5 9

rmmov 6 a

rmmov 7 b

Hex code:

00 f0 03 00 00 00 00 f1 02 00 00 00 00 f2 06 00 00 00 00 f3 01 00 00 00 30 00 00 00 00 00 30 10 01 00 00 00 30 20 02 00 00 00 30 30 03 00 00 00 00 f4 04 00 00 00 00 f5 06 00 00 00 00 f6 03 00 00 00 00 f7 09 00 00 00 30 40 04 00 00 00 30 50 05 00 00 00 30 60 06 00 00 00 30 70 07 00 00 00 20 40 00 00 00 00 20 50 01 00 00 00 20 60 02 00 00 00 20 70 03 00 00 00 20 00 04 00 00 00 20 10 05 00 00 00 20 20 06 00 00 00 20 30 07 00 00 00 40 04 00 00 00 00 40 15 00 00 00 00 40 26 00 00 00 00 40 37 00 00 00 00 30 40 08 00 00 00 30 50 09 00 00 00 30 60 0a 00 00 00 30 70 0b 00 00 00 70 00 00 00 00 00