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January 29, 2021

ECEC 355

Project 1

Section 5

1. Instruction Types:

   add x10, x10, x25 – **R-Type.**

   ld x9, 0(x10) – **I-Type.**

   addi x22, x22, 1 - **I-Type.**

   slli x11, x22, 3 - **I-Type.**

   bne x8, x24, -4 – **SB-Type.**

2. Binary Representation

   add x10, x10, x25

Funct7	Rs2	Rs1	Funct3	rd	opcode
0	25	10	0	10	51

0000000 | 11001 | 01010 | 000 | 01010 | 0110011

ld x9, 0(x10)

immediate	Rs1	Funct3	rd	opcode
0	10	3	9	3

000000000000 | 01010 | 011 | 01001 | 0000011

addi x22, x22, 1

immediate	Rs1	Funct3	rd	opcode
1	22	0	22	19

000000000001 | 10110 | 000 | 10110 | 0010011

slli x11, x22, 3

Funct6	immediate	Rs1	Funct3	rd	opcode
0	3	22	1	11	19

000000 | 000011 | 10110 | 001 | 01011 | 0010011

bne x8, x24, -4
4 = 0000 0000 0100
-4 = 1111 1111 1011 + 1 = 1111 1111 1100

Immed[12]	Immed[10:5]	Rs2	Rs1	Funct3	Immed[4:1]	Immed[11]	opcode
1	111111	24	8	1	1110	1	1100111

1 | 111111 | 11000 | 01000 | 001| 1110 | 1 | 1100111

Section 6

In this section we had to edit the code in “Parser.c” to support the other 4 instructions. First, we added the necessary string comparisons in the if statements to support the new types of instructions (ld, addi, slli, bne). Since those instructions have different structures, for example ld lacks a third register in its syntax, we created a few new methods to parse through the instructions depending on their format. For every case we use different string parsing processes to get the values of their registers and immediate values. The “SB” type was the trickiest one because of its immediate value being split into multiple sections. To overcome this, we first converted the immediate value into binary, then we split it into the necessary sections.

After obtaining the necessary positions for immediate/rs1/rs2/rd we proceed to build the resulting binary form. Every instruction has different positions, therefore there are three different if statements which shift the corresponding position with the necessary number of bits to accommodate the necessary format.