

## Assignment - 2

A simple processor consists of five stages: Information fetch, decode, execute, memory and writeback.

1. **Fetch:** Instruction is fetched from the memory and pc (program counter) is incremented every time an instruction is fetched.
2. **Decode:** Instruction which has been fetched is decoded in this stage to identify the operation which has to be performed. Then, it extracts the operands which have to be used in that specific operation using control signals and then passes it to the next stage.
3. **Execute:** ALU performs the operation based on function opcode (if required) and the instructions and signals which it receives from the decode stage.
4. **Memory:** In memory, we either write the result of the operation in the memory or read from the memory and store it in some register based on the control signals.
5. **Write Back:** Based on the result of the mux, it either writes back the data stored in the memory to the register or the result of alu in the register

Non pipelined:

In non-pipelined processor, all the five stages are executed immediately one after another for every instruction completely. All the five stages of a processor have to be executed for each instruction before going to the next instruction or else there can loss of data which leads to wrong output.

Pipelined:

In a pipelined processor, there are pipeline registers which store the values required during the next stage including the control signals to make sure data loss does not occur. Then based on hazard detection control signal, it understands how to forward result of one stage of an instruction to input of some stage of another instruction. It detects all the discrepancies and solves them to give correct result.\

### Pipelined output (Factorial):

{'00000': '\$zero', '01001': '\$t1', '01010': '\$t2', '01011': '\$t3', '01100': '\$t4', '01101': '\$t5', '01110': '\$t6', '01111': '\$t7', '11000': '\$t8', '11001': '\$t9', '10000': '\$s0', '10001': '\$s1', '10100': '\$s4', '10101': '\$s5'}

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 0, '\$t5': 0, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 0

Instruction is 0010000000001100000000000000110

001000 {'RegDst': False, 'ALUSrc': True, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 2, 'MemWr': False, 'Branch': False, 'JMP': False}

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 0, '\$t5': 0, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 0

Hi I am In Execute

This is my value for x and y 0 , , 0

these are my registers 0 and 0 and aluop = 2

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 0, '\$t5': 0, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 0

EX: None

Hi I am In Execute

This is my value for x and y 0 , , 0

these are my registers 0 and 0 and aluop = 2

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 0, '\$t5': 0, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 0

pc: 4194308

result None

Hi I am In Execute

This is my value for x and y 0 , , 6

these are my registers 0 and 6 and aluop = 2

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 6, '\$t5': 0, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 1

pc: 4194312

result None

Hi I am In Execute

This is my value for x and y 0 , , 6

these are my registers 0 and 6 and aluop = 2

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 6, '\$t5': 0, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 2

pc: 4194316

result None

Hi I am In Execute

This is my value for x and y 0 , , 0

these are my registers 0 and 6 and aluop = 2

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 6, '\$t5': 0, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 3

pc: 4194320

result None

Hi I am In Execute

This is my value for x and y 1 , , 1

these are my registers 0 and 1 and aluop = 2

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 1, '\$t5': 0, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 4

pc: 4194324

result None

Hi I am In Execute

This is my value for x and y 0 , , 0

these are my registers 0 and 0 and aluop = 2

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 0, '\$t5': 0, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 5

pc: 4194328

result None

Hi I am In Execute

This is my value for x and y 0 , , 0

these are my registers 0 and 5 and aluop = 2

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 5, '\$t5': 0, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 6

pc: 4194332

result None

Hi I am In Execute

This is my value for x and y 0 , , 0

these are my registers 0 and 26656 and aluop = 2

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 26656, '\$t5': 0, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 7

pc: 4194336

result None

Hi I am In Execute

This is my value for x and y 0 , , 0

these are my registers 0 and -16352 and aluop = 2

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': -16352, '\$t5': 0, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 8

pc: 4194340

result None

Hi I am In Execute

This is my value for x and y -14304 , , -14304

these are my registers 0 and -14304 and aluop = 2

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': -14304, '\$t5': 0, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': -14304, '\$t5': 0, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

{'00000': '\$zero', '01001': '\$t1', '01010': '\$t2', '01011': '\$t3', '01100': '\$t4', '01101': '\$t5', '01110': '\$t6', '01111': '\$t7', '11000': '\$t8', '11001': '\$t9', '10000': '\$s0', '10001': '\$s1', '10100': '\$s4', '10101': '\$s5'}

### Pipelined (Factorial):

{'00000': '\$zero', '01001': '\$t1', '01010': '\$t2', '01011': '\$t3', '01100': '\$t4', '01101': '\$t5', '01110': '\$t6', '01111': '\$t7', '11000': '\$t8', '11001': '\$t9', '10000': '\$s0', '10001': '\$s1', '10100': '\$s4', '10101': '\$s5'}

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 0, '\$t5': 0, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 0

Instruction is 00100000000100000000000000000110

001000 {'RegDst': False, 'ALUSrc': True, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 2, 'MemWr': False, 'Branch': False, 'JMP': False}

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 0, '\$t5': 0, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 0

Hi I am In Execute

This is my value for x and y 0 , , 0

these are my registers 0 and 0 and aluop = 2

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 0, '\$t5': 0, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 0

EX: None

Hi I am In Execute

This is my value for x and y 0 , , 0

these are my registers 0 and 0 and aluop = 2

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 0, '\$t5': 0, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 0

pc: 4194308

result None

Hi I am In Execute

This is my value for x and y 0 , , 6

these are my registers 0 and 6 and aluop = 2

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 0, '\$t5': 0, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 6, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 1

pc: 4194312

result None

Hi I am In Execute

This is my value for x and y 0 , , 6

these are my registers 0 and 6 and aluop = 2

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 0, '\$t5': 0, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 6, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 2

pc: 4194316

result None

Hi I am In Execute

This is my value for x and y 6 , , 0

these are my registers 0 and 6 and aluop = 2

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 0, '\$t5': 0, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 6, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 3

pc: 4194320

result None

Hi I am In Execute

This is my value for x and y 0 , , 0

these are my registers 0 and 6 and aluop = 2

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 0, '\$t5': 0, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 6, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 4

pc: 4194324

result None

Hi I am In Execute

This is my value for x and y 0 , , 0

these are my registers 0 and 1 and aluop = 2

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 0, '\$t5': 0, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 1, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 5

pc: 4194328

result None

Hi I am In Execute

This is my value for x and y 0 , , 0

these are my registers 0 and 3 and aluop = 2

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 0, '\$t5': 0, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 3, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 6

pc: 4194332

result None

Hi I am In Execute

This is my value for x and y 0 , , 0

these are my registers 0 and 26626 and aluop = 2

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 0, '\$t5': 0, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 26626, '\$s1': 0, '\$s4': 0, '\$s5': 0}



{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 0, '\$t5': 0, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 26626, '\$s1': 0, '\$s4': 0, '\$s5': 0}

{'00000': '\$zero', '01001': '\$t1', '01010': '\$t2', '01011': '\$t3', '01100': '\$t4', '01101': '\$t5', '01110': '\$t6', '01111': '\$t7', '11000': '\$t8', '11001': '\$t9', '10000': '\$s0', '10001': '\$s1', '10100': '\$s4', '10101': '\$s5'}

### Nonpipelined (Factorial):

{'00000': '\$zero', '01001': '\$t1', '01010': '\$t2', '01011': '\$t3', '01100': '\$t4', '01101': '\$t5', '01110': '\$t6', '01111': '\$t7', '11000': '\$t8', '11001': '\$t9', '10000': '\$s0', '10001': '\$s1', '10100': '\$s4', '10101': '\$s5'}

HI I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 0, '\$t5': 0, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 0

Instruction is 0010000000010000000000000000110

001000 {'RegDst': False, 'ALUSrc': True, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 2, 'MemWr': False, 'Branch': False, 'JMP': False}

ID: 00000 10000 10000 6

Hi I am In Execute

This is my value for x and y 0 , , 0

these are my registers 0 and 0 and aluop = 2

EX: 6

pc: 4194308

result 6

HI I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 0, '\$t5': 0, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 6, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 1

Instruction is 00100010000011000000000000000000

001000 {'RegDst': False, 'ALUSrc': True, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 2, 'MemWr': False, 'Branch': False, 'JMP': False}

ID: 10000 01100 01100 0

Hi I am In Execute

This is my value for x and y 6 , , 0

these are my registers 6 and 0 and aluop = 2

EX: 6

pc: 4194312

result 6

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 6, '\$t5': 0, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 6, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 2

Instruction is 00100000000110100000000000000001

001000 {'RegDst': False, 'ALUSrc': True, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 2, 'MemWr': False, 'Branch': False, 'JMP': False}

ID: 00000 01101 01101 1

Hi I am In Execute

This is my value for x and y 0 , , 0

these are my registers 0 and 0 and aluop = 2

EX: 1

pc: 4194316

result 1

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 6, '\$t5': 1, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 6, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 3

Instruction is 00010001100000000000000000000011

000100 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': False, 'MemRd': False, 'AluOP': 3, 'MemWr': False, 'Branch': True, 'JMP': False}

ID: 01100 00000 00000 3

Hi I am In Execute

This is my value for x and y 6 , , 0

these are my registers 6 and 0 and aluop = 3

6

EX: 6

pc: 4194320

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 6, '\$t5': 1, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 6, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 4

Instruction is 0111000110101100011010000000010

011100 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 4, 'MemWr': False, 'Branch': False, 'JMP': False}

ID: 01101 01100 01101 26626

Hi I am In Execute

This is my value for x and y 1 , , 6

these are my registers 1 and 6 and aluop = 4

EX: 6

pc: 4194324

result 6

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 6, '\$t5': 6, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 6, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 5

Instruction is 0010000110001100111111111111111

001000 {'RegDst': False, 'ALUSrc': True, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 2, 'MemWr': False, 'Branch': False, 'JMP': False}

ID: 01100 01100 01100 -1

Hi I am In Execute

This is my value for x and y 6 , , 6

these are my registers 6 and 6 and aluop = 2

EX: 5

pc: 4194328

result 5

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 5, '\$t5': 6, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 6, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 6

Instruction is 00001000000100000000000000000011

000010 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': False, 'MemRd': False, 'MemWr': False, 'Branch': False, 'JMP': True}

I am jumping 4194316

ID: 0 0 0 0

EX: None

pc: 4194316

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 5, '\$t5': 6, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 6, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 3

Instruction is 00010001100000000000000000000011

000100 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': False, 'MemRd': False, 'AluOP': 3, 'MemWr': False, 'Branch': True, 'JMP': False}

ID: 01100 00000 00000 3

Hi I am In Execute

This is my value for x and y 5 , , 0

these are my registers 5 and 0 and aluop = 3

5

EX: 5

pc: 4194320

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 5, '\$t5': 6, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 6, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 4

Instruction is 0111000110101100011010000000010

011100 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 4, 'MemWr': False, 'Branch': False, 'JMP': False}

ID: 01101 01100 01101 26626

Hi I am In Execute

This is my value for x and y 6 , , 5

these are my registers 6 and 5 and aluop = 4

EX: 30

pc: 4194324

result 30

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 5, '\$t5': 30, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 6, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 5

Instruction is 0010000110001100111111111111111

001000 {'RegDst': False, 'ALUSrc': True, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 2, 'MemWr': False, 'Branch': False, 'JMP': False}

ID: 01100 01100 01100 -1

Hi I am In Execute

This is my value for x and y 5 , , 5

these are my registers 5 and 5 and aluop = 2

EX: 4

pc: 4194328

result 4

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 4, '\$t5': 30, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 6, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 6

Instruction is 00001000000100000000000000000011

000010 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': False, 'MemRd': False, 'MemWr': False, 'Branch': False, 'JMP': True}

I am jumping 4194316

ID: 0 0 0 0

EX: None

pc: 4194316

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 4, '\$t5': 30, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 6, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 3

Instruction is 00010001100000000000000000000011

000100 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': False, 'MemRd': False, 'AluOP': 3, 'MemWr': False, 'Branch': True, 'JMP': False}

ID: 01100 00000 00000 3

Hi I am In Execute

This is my value for x and y 4 , , 0

these are my registers 4 and 0 and aluop = 3

4

EX: 4

pc: 4194320

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 4, '\$t5': 30, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 6, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 4

Instruction is 01110001101011000110100000000010

011100 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 4, 'MemWr': False, 'Branch': False, 'JMP': False}

ID: 01101 01100 01101 26626

Hi I am In Execute

This is my value for x and y 30 , , 4

these are my registers 30 and 4 and aluop = 4

EX: 120

pc: 4194324

result 120

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 4, '\$t5': 120, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 6, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 5

Instruction is 00100001100011001111111111111111

001000 {'RegDst': False, 'ALUSrc': True, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 2, 'MemWr': False, 'Branch': False, 'JMP': False}

ID: 01100 01100 01100 -1

Hi I am In Execute

This is my value for x and y 4 , , 4

these are my registers 4 and 4 and aluop = 2

EX: 3

pc: 4194328

result 3

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 3, '\$t5': 120, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 6, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 6

Instruction is 00001000000100000000000000000011

000010 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': False, 'MemRd': False, 'MemWr': False, 'Branch': False, 'JMP': True}

I am jumping 4194316

ID: 0 0 0 0

EX: None

pc: 4194316

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 3, '\$t5': 120, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 6, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 3

Instruction is 00010001100000000000000000000011

000100 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': False, 'MemRd': False, 'AluOP': 3, 'MemWr': False, 'Branch': True, 'JMP': False}

ID: 01100 00000 00000 3

Hi I am In Execute

This is my value for x and y 3 , , 0

these are my registers 3 and 0 and aluop = 3

3

EX: 3

pc: 4194320

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 3, '\$t5': 120, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 6, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 4

Instruction is 01110001101011000110100000000010

011100 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 4, 'MemWr': False, 'Branch': False, 'JMP': False}

ID: 01101 01100 01101 26626

Hi I am In Execute

This is my value for x and y 120 , , 3

these are my registers 120 and 3 and aluop = 4

EX: 360



pc: 4194324

result 360

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 3, '\$t5': 360, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 6, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 5

Instruction is 0010000110001100111111111111111

001000 {'RegDst': False, 'ALUSrc': True, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 2, 'MemWr': False, 'Branch': False, 'JMP': False}

ID: 01100 01100 01100 -1

Hi I am In Execute

This is my value for x and y 3 , , 3

these are my registers 3 and 3 and aluop = 2

EX: 2

pc: 4194328

result 2

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 2, '\$t5': 360, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 6, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 6

Instruction is 00001000000100000000000000000011

000010 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': False, 'MemRd': False, 'MemWr': False, 'Branch': False, 'JMP': True}

I am jumping 4194316

ID: 0 0 0 0

EX: None

pc: 4194316

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 2, '\$t5': 360, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 6, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 3

Instruction is 00010001100000000000000000000011

000100 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': False, 'MemRd': False, 'AluOP': 3, 'MemWr': False, 'Branch': True, 'JMP': False}

ID: 01100 00000 00000 3

Hi I am In Execute

This is my value for x and y 2 , , 0

these are my registers 2 and 0 and aluop = 3

2

EX: 2

pc: 4194320

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 2, '\$t5': 360, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 6, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 4

Instruction is 01110001101011000110100000000010

011100 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 4, 'MemWr': False, 'Branch': False, 'JMP': False}

ID: 01101 01100 01101 26626

Hi I am In Execute

This is my value for x and y 360 , , 2

these are my registers 360 and 2 and aluop = 4

EX: 720

pc: 4194324

result 720

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 2, '\$t5': 720, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 6, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 5

Instruction is 00100001100011001111111111111111

001000 {'RegDst': False, 'ALUSrc': True, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 2, 'MemWr': False, 'Branch': False, 'JMP': False}

ID: 01100 01100 01100 -1

Hi I am In Execute

This is my value for x and y 2 , , 2

these are my registers 2 and 2 and aluop = 2

EX: 1

pc: 4194328

result 1

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 1, '\$t5': 720, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 6, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 6

Instruction is 000010000000100000000000000000011

000010 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': False, 'MemRd': False, 'MemWr': False, 'Branch': False, 'JMP': True}

I am jumping 4194316

ID: 0 0 0 0

EX: None

pc: 4194316

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 1, '\$t5': 720, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 6, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 3

Instruction is 000100011000000000000000000000011

000100 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': False, 'MemRd': False, 'AluOP': 3, 'MemWr': False, 'Branch': True, 'JMP': False}

ID: 01100 00000 00000 3

Hi I am In Execute

This is my value for x and y 1 , , 0

these are my registers 1 and 0 and aluop = 3

1

EX: 1

pc: 4194320

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 1, '\$t5': 720, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 6, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 4

Instruction is 0111000110101100011010000000010

011100 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 4, 'MemWr': False, 'Branch': False, 'JMP': False}

ID: 01101 01100 01101 26626

Hi I am In Execute

This is my value for x and y 720 , , 1

these are my registers 720 and 1 and aluop = 4

EX: 720

pc: 4194324

result 720

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 1, '\$t5': 720, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 6, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 5

Instruction is 0010000110001100111111111111111

001000 {'RegDst': False, 'ALUSrc': True, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 2, 'MemWr': False, 'Branch': False, 'JMP': False}

ID: 01100 01100 01100 -1

Hi I am In Execute

This is my value for x and y 1 , , 1

these are my registers 1 and 1 and aluop = 2

EX: 0

pc: 4194328

result 0

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 0, '\$t5': 720, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 6, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 6

Instruction is 000010000000100000000000000000011

000010 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': False, 'MemRd': False, 'MemWr': False, 'Branch': False, 'JMP': True}

I am jumping 4194316

ID: 0 0 0 0

EX: None

pc: 4194316

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 0, '\$t5': 720, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 6, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 3

Instruction is 000100011000000000000000000000011

000100 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': False, 'MemRd': False, 'AluOP': 3, 'MemWr': False, 'Branch': True, 'JMP': False}

ID: 01100 00000 00000 3

Hi I am In Execute

This is my value for x and y 0 , , 0

these are my registers 0 and 0 and aluop = 3

0

branching to 4194328

EX: 0

pc: 4194332

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 0, '\$t5': 720, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 6, '\$s1': 0, '\$s4': 0, '\$s5': 0}

```
{'00000': '$zero', '01001': '$t1', '01010': '$t2', '01011': '$t3', '01100': '$t4', '01101': '$t5', '01110': '$t6',  
'01111': '$t7', '11000': '$t8', '11001': '$t9', '10000': '$s0', '10001': '$s1', '10100': '$s4', '10101': '$s5'}
```

### Nonpipelined (Fibonacci):

```
{'00000': '$zero', '01001': '$t1', '01010': '$t2', '01011': '$t3', '01100': '$t4', '01101': '$t5', '01110': '$t6',  
'01111': '$t7', '11000': '$t8', '11001': '$t9', '10000': '$s0', '10001': '$s1', '10100': '$s4', '10101': '$s5'}
```

Hi I am in IF

```
{'$zero': 0, '$t1': 0, '$t2': 0, '$t3': 0, '$t4': 0, '$t5': 0, '$t6': 0, '$t7': 0, '$t8': 0, '$t9': 0, '$s0': 0, '$s1': 0,  
'$s4': 0, '$s5': 0}
```

pc in IF = 0

Instruction is 0010000000001100000000000000110

```
001000 {'RegDst': False, 'ALUSrc': True, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 2,  
'MemWr': False, 'Branch': False, 'JMP': False}
```

ID: 00000 01100 01100 6

Hi I am In Execute

This is my value for x and y 0 , , 0

these are my registers 0 and 0 and aluop = 2

EX: 6

pc: 4194308

result 6

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 6, '\$t5': 0, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 0, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 1

Instruction is 00100000000110010000000000000001

001000 {'RegDst': False, 'ALUSrc': True, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 2, 'MemWr': False, 'Branch': False, 'JMP': False}

ID: 00000 11001 11001 1

Hi I am In Execute

This is my value for x and y 0 , , 0

these are my registers 0 and 0 and aluop = 2

EX: 1

pc: 4194312

result 1

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 6, '\$t5': 0, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 1, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 2

Instruction is 00100001100011001111111111111111

001000 {'RegDst': False, 'ALUSrc': True, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 2, 'MemWr': False, 'Branch': False, 'JMP': False}

ID: 01100 01100 01100 -1

Hi I am In Execute

This is my value for x and y 6 , , 6

these are my registers 6 and 6 and aluop = 2

EX: 5

pc: 4194316

result 5

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 5, '\$t5': 0, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 1, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 3

Instruction is 00010001100000000000000000000101

000100 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': False, 'MemRd': False, 'AluOP': 3, 'MemWr': False, 'Branch': True, 'JMP': False}

ID: 01100 00000 00000 5

Hi I am In Execute

This is my value for x and y 5 , , 0

these are my registers 5 and 0 and aluop = 3

5

EX: 5

pc: 4194320

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 5, '\$t5': 0, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 1, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 4

Instruction is 00000011001110000110100000100000

Yes this can also be true if R type

this is good and instruct = <class 'str'>

Yes this can be true too

000000 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 2, 'MemWr': False, 'Branch': False, 'JMP': False}

ID: 11001 11000 01101 26656

Hi I am In Execute

This is my value for x and y 1 , , 0

these are my registers 1 and 0 and aluop = 2

EX: 1

pc: 4194324

result 1

Hi I am in IF



{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 5, '\$t5': 1, '\$t6': 0, '\$t7': 0, '\$t8': 0, '\$t9': 1, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 5

Instruction is 00000011001000001100000000100000

Yes this can also be true if R type

this is good and instruct = <class 'str'>

Yes this can be true too

000000 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 2, 'MemWr': False, 'Branch': False, 'JMP': False}

ID: 11001 00000 11000 -16352

Hi I am In Execute

This is my value for x and y 1 , , 0

these are my registers 1 and 0 and aluop = 2

EX: 1

pc: 4194328

result 1

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 5, '\$t5': 1, '\$t6': 0, '\$t7': 0, '\$t8': 1, '\$t9': 1, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 6

Instruction is 00000001101000001100100000100000

Yes this can also be true if R type

this is good and instruct = <class 'str'>

Yes this can be true too

000000 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 2, 'MemWr': False, 'Branch': False, 'JMP': False}

ID: 01101 00000 11001 -14304

Hi I am In Execute

This is my value for x and y 1 , , 0

these are my registers 1 and 0 and aluop = 2

EX: 1

pc: 4194332

result 1

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 5, '\$t5': 1, '\$t6': 0, '\$t7': 0, '\$t8': 1, '\$t9': 1, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 7

Instruction is 00100001100011001111111111111111

001000 {'RegDst': False, 'ALUSrc': True, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 2, 'MemWr': False, 'Branch': False, 'JMP': False}

ID: 01100 01100 01100 -1

Hi I am In Execute

This is my value for x and y 5 , , 5

these are my registers 5 and 5 and aluop = 2

EX: 4

pc: 4194336

result 4

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 4, '\$t5': 1, '\$t6': 0, '\$t7': 0, '\$t8': 1, '\$t9': 1, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 8

Instruction is 00001000000100000000000000000011

000010 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': False, 'MemRd': False, 'MemWr': False, 'Branch': False, 'JMP': True}

I am jumping 4194316

ID: 0 0 0 0

EX: None

pc: 4194316

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 4, '\$t5': 1, '\$t6': 0, '\$t7': 0, '\$t8': 1, '\$t9': 1, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 3

Instruction is 00010001100000000000000000000101

000100 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': False, 'MemRd': False, 'AluOP': 3, 'MemWr': False, 'Branch': True, 'JMP': False}

ID: 01100 00000 00000 5

Hi I am In Execute

This is my value for x and y 4 , , 0

these are my registers 4 and 0 and aluop = 3

4

EX: 4

pc: 4194320

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 4, '\$t5': 1, '\$t6': 0, '\$t7': 0, '\$t8': 1, '\$t9': 1, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 4

Instruction is 00000011001110000110100000100000

Yes this can also be true if R type

this is good and instruct = <class 'str'>

Yes this can be true too

000000 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 2, 'MemWr': False, 'Branch': False, 'JMP': False}

ID: 11001 11000 01101 26656

Hi I am In Execute

This is my value for x and y 1 , , 1

these are my registers 1 and 1 and aluop = 2

EX: 2

pc: 4194324

result 2

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 4, '\$t5': 2, '\$t6': 0, '\$t7': 0, '\$t8': 1, '\$t9': 1, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 5

Instruction is 00000011001000001100000000100000

Yes this can also be true if R type

this is good and instruct = <class 'str'>

Yes this can be true too

000000 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 2, 'MemWr': False, 'Branch': False, 'JMP': False}

ID: 11001 00000 11000 -16352

Hi I am In Execute

This is my value for x and y 1 , , 0

these are my registers 1 and 0 and aluop = 2

EX: 1

pc: 4194328

result 1

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 4, '\$t5': 2, '\$t6': 0, '\$t7': 0, '\$t8': 1, '\$t9': 1, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 6

Instruction is 00000001101000001100100000100000

Yes this can also be true if R type

this is good and instruct = <class 'str'>

Yes this can be true too

000000 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 2, 'MemWr': False, 'Branch': False, 'JMP': False}

ID: 01101 00000 11001 -14304

Hi I am In Execute

This is my value for x and y 2 , , 0

these are my registers 2 and 0 and aluop = 2

EX: 2

pc: 4194332

result 2

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 4, '\$t5': 2, '\$t6': 0, '\$t7': 0, '\$t8': 1, '\$t9': 2, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 7

Instruction is 00100001100011001111111111111111

001000 {'RegDst': False, 'ALUSrc': True, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 2, 'MemWr': False, 'Branch': False, 'JMP': False}

ID: 01100 01100 01100 -1

Hi I am In Execute

This is my value for x and y 4 , , 4

these are my registers 4 and 4 and aluop = 2

EX: 3

pc: 4194336

result 3

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 3, '\$t5': 2, '\$t6': 0, '\$t7': 0, '\$t8': 1, '\$t9': 2, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 8

Instruction is 00001000000010000000000000000011

000010 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': False, 'MemRd': False, 'MemWr': False, 'Branch': False, 'JMP': True}

I am jumping 4194316

ID: 0 0 0 0

EX: None

pc: 4194316

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 3, '\$t5': 2, '\$t6': 0, '\$t7': 0, '\$t8': 1, '\$t9': 2, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 3

Instruction is 00010001100000000000000000000101

000100 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': False, 'MemRd': False, 'AluOP': 3, 'MemWr': False, 'Branch': True, 'JMP': False}

ID: 01100 00000 00000 5

Hi I am In Execute

This is my value for x and y 3 , , 0

these are my registers 3 and 0 and aluop = 3

3

EX: 3

pc: 4194320

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 3, '\$t5': 2, '\$t6': 0, '\$t7': 0, '\$t8': 1, '\$t9': 2, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 4

Instruction is 00000011001110000110100000100000

Yes this can also be true if R type

this is good and instruct = <class 'str'>

Yes this can be true too

000000 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 2, 'MemWr': False, 'Branch': False, 'JMP': False}

ID: 11001 11000 01101 26656

Hi I am In Execute

This is my value for x and y 2 , , 1

these are my registers 2 and 1 and aluop = 2

EX: 3

pc: 4194324

result 3

Hi I am in IF

```
{'$zero': 0, '$t1': 0, '$t2': 0, '$t3': 0, '$t4': 3, '$t5': 3, '$t6': 0, '$t7': 0, '$t8': 1, '$t9': 2, '$s0': 0, '$s1': 0, '$s4': 0, '$s5': 0}
```

pc in IF = 5

Instruction is 00000011001000001100000000100000

Yes this can also be true if R type

this is good and instruct = <class 'str'>

Yes this can be true too

```
000000 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 2, 'MemWr': False, 'Branch': False, 'JMP': False}
```

ID: 11001 00000 11000 -16352

Hi I am In Execute

This is my value for x and y 2 , , 0

these are my registers 2 and 0 and aluop = 2

EX: 2

pc: 4194328

result 2

Hi I am in IF

```
{'$zero': 0, '$t1': 0, '$t2': 0, '$t3': 0, '$t4': 3, '$t5': 3, '$t6': 0, '$t7': 0, '$t8': 2, '$t9': 2, '$s0': 0, '$s1': 0, '$s4': 0, '$s5': 0}
```

pc in IF = 6

Instruction is 00000001101000001100100000100000

Yes this can also be true if R type

this is good and instruct = <class 'str'>

Yes this can be true too

```
000000 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 2, 'MemWr': False, 'Branch': False, 'JMP': False}
```

ID: 01101 00000 11001 -14304

Hi I am In Execute

This is my value for x and y 3 , , 0

these are my registers 3 and 0 and aluop = 2

EX: 3

pc: 4194332

result 3

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 3, '\$t5': 3, '\$t6': 0, '\$t7': 0, '\$t8': 2, '\$t9': 3, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 7

Instruction is 00100001100011001111111111111111

001000 {'RegDst': False, 'ALUSrc': True, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 2, 'MemWr': False, 'Branch': False, 'JMP': False}

ID: 01100 01100 01100 -1

Hi I am In Execute

This is my value for x and y 3 , , 3

these are my registers 3 and 3 and aluop = 2

EX: 2

pc: 4194336

result 2

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 2, '\$t5': 3, '\$t6': 0, '\$t7': 0, '\$t8': 2, '\$t9': 3, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 8

Instruction is 00001000000010000000000000000011

000010 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': False, 'MemRd': False, 'MemWr': False, 'Branch': False, 'JMP': True}

I am jumping 4194316

ID: 0 0 0 0

EX: None

pc: 4194316

Hi I am in IF



{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 2, '\$t5': 3, '\$t6': 0, '\$t7': 0, '\$t8': 2, '\$t9': 3, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 3

Instruction is 0001000110000000000000000000101

000100 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': False, 'MemRd': False, 'AluOP': 3, 'MemWr': False, 'Branch': True, 'JMP': False}

ID: 01100 00000 00000 5

Hi I am In Execute

This is my value for x and y 2 , , 0

these are my registers 2 and 0 and aluop = 3

2

EX: 2

pc: 4194320

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 2, '\$t5': 3, '\$t6': 0, '\$t7': 0, '\$t8': 2, '\$t9': 3, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 4

Instruction is 00000011001110000110100000100000

Yes this can also be true if R type

this is good and instruct = <class 'str'>

Yes this can be true too

000000 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 2, 'MemWr': False, 'Branch': False, 'JMP': False}

ID: 11001 11000 01101 26656

Hi I am In Execute

This is my value for x and y 3 , , 2

these are my registers 3 and 2 and aluop = 2

EX: 5

pc: 4194324

result 5

Hi I am in IF

```
{'$zero': 0, '$t1': 0, '$t2': 0, '$t3': 0, '$t4': 2, '$t5': 5, '$t6': 0, '$t7': 0, '$t8': 2, '$t9': 3, '$s0': 0, '$s1': 0, '$s4': 0, '$s5': 0}
```

pc in IF = 5

Instruction is 00000011001000001100000000100000

Yes this can also be true if R type

this is good and instruct = <class 'str'>

Yes this can be true too

```
000000 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 2, 'MemWr': False, 'Branch': False, 'JMP': False}
```

ID: 11001 00000 11000 -16352

Hi I am In Execute

This is my value for x and y 3 , , 0

these are my registers 3 and 0 and aluop = 2

EX: 3

pc: 4194328

result 3

Hi I am in IF

```
{'$zero': 0, '$t1': 0, '$t2': 0, '$t3': 0, '$t4': 2, '$t5': 5, '$t6': 0, '$t7': 0, '$t8': 3, '$t9': 3, '$s0': 0, '$s1': 0, '$s4': 0, '$s5': 0}
```

pc in IF = 6

Instruction is 00000001101000001100100000100000

Yes this can also be true if R type

this is good and instruct = <class 'str'>

Yes this can be true too

```
000000 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 2, 'MemWr': False, 'Branch': False, 'JMP': False}
```

ID: 01101 00000 11001 -14304

Hi I am In Execute

This is my value for x and y 5 , , 0

these are my registers 5 and 0 and aluop = 2

EX: 5

pc: 4194332

result 5

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 2, '\$t5': 5, '\$t6': 0, '\$t7': 0, '\$t8': 3, '\$t9': 5, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 7

Instruction is 00100001100011001111111111111111

001000 {'RegDst': False, 'ALUSrc': True, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 2, 'MemWr': False, 'Branch': False, 'JMP': False}

ID: 01100 01100 01100 -1

Hi I am In Execute

This is my value for x and y 2 , , 2

these are my registers 2 and 2 and aluop = 2

EX: 1

pc: 4194336

result 1

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 1, '\$t5': 5, '\$t6': 0, '\$t7': 0, '\$t8': 3, '\$t9': 5, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 8

Instruction is 00001000000010000000000000000011

000010 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': False, 'MemRd': False, 'MemWr': False, 'Branch': False, 'JMP': True}

I am jumping 4194316

ID: 0 0 0 0

EX: None

pc: 4194316

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 1, '\$t5': 5, '\$t6': 0, '\$t7': 0, '\$t8': 3, '\$t9': 5, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 3

Instruction is 00010001100000000000000000000101

000100 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': False, 'MemRd': False, 'AluOP': 3, 'MemWr': False, 'Branch': True, 'JMP': False}

ID: 01100 00000 00000 5

Hi I am In Execute

This is my value for x and y 1 , , 0

these are my registers 1 and 0 and aluop = 3

1

EX: 1

pc: 4194320

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 1, '\$t5': 5, '\$t6': 0, '\$t7': 0, '\$t8': 3, '\$t9': 5, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 4

Instruction is 00000011001110000110100000100000

Yes this can also be true if R type

this is good and instruct = <class 'str'>

Yes this can be true too

000000 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 2, 'MemWr': False, 'Branch': False, 'JMP': False}

ID: 11001 11000 01101 26656

Hi I am In Execute

This is my value for x and y 5 , , 3

these are my registers 5 and 3 and aluop = 2

EX: 8

pc: 4194324

result 8

Hi I am in IF

```
{'$zero': 0, '$t1': 0, '$t2': 0, '$t3': 0, '$t4': 1, '$t5': 8, '$t6': 0, '$t7': 0, '$t8': 3, '$t9': 5, '$s0': 0, '$s1': 0, '$s4': 0, '$s5': 0}
```

pc in IF = 5

Instruction is 00000011001000001100000000100000

Yes this can also be true if R type

this is good and instruct = <class 'str'>

Yes this can be true too

```
000000 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 2, 'MemWr': False, 'Branch': False, 'JMP': False}
```

ID: 11001 00000 11000 -16352

Hi I am In Execute

This is my value for x and y 5 , , 0

these are my registers 5 and 0 and aluop = 2

EX: 5

pc: 4194328

result 5

Hi I am in IF

```
{'$zero': 0, '$t1': 0, '$t2': 0, '$t3': 0, '$t4': 1, '$t5': 8, '$t6': 0, '$t7': 0, '$t8': 5, '$t9': 5, '$s0': 0, '$s1': 0, '$s4': 0, '$s5': 0}
```

pc in IF = 6

Instruction is 00000001101000001100100000100000

Yes this can also be true if R type

this is good and instruct = <class 'str'>

Yes this can be true too

```
000000 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 2, 'MemWr': False, 'Branch': False, 'JMP': False}
```

ID: 01101 00000 11001 -14304

Hi I am In Execute

This is my value for x and y 8 , , 0

these are my registers 8 and 0 and aluop = 2

EX: 8

pc: 4194332

result 8

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 1, '\$t5': 8, '\$t6': 0, '\$t7': 0, '\$t8': 5, '\$t9': 8, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 7

Instruction is 00100001100011001111111111111111

001000 {'RegDst': False, 'ALUSrc': True, 'MemReg': False, 'RegWr': True, 'MemRd': False, 'AluOP': 2, 'MemWr': False, 'Branch': False, 'JMP': False}

ID: 01100 01100 01100 -1

Hi I am In Execute

This is my value for x and y 1 , , 1

these are my registers 1 and 1 and aluop = 2

EX: 0

pc: 4194336

result 0

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 0, '\$t5': 8, '\$t6': 0, '\$t7': 0, '\$t8': 5, '\$t9': 8, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 8

Instruction is 00001000000010000000000000000011

000010 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': False, 'MemRd': False, 'MemWr': False, 'Branch': False, 'JMP': True}

I am jumping 4194316

ID: 0 0 0 0

EX: None

pc: 4194316

Hi I am in IF

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 0, '\$t5': 8, '\$t6': 0, '\$t7': 0, '\$t8': 5, '\$t9': 8, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

pc in IF = 3

Instruction is 00010001100000000000000000000101

000100 {'RegDst': True, 'ALUSrc': False, 'MemReg': False, 'RegWr': False, 'MemRd': False, 'AluOP': 3, 'MemWr': False, 'Branch': True, 'JMP': False}

ID: 01100 00000 00000 5

Hi I am In Execute

This is my value for x and y 0 , , 0

these are my registers 0 and 0 and aluop = 3

0

branching to 4194336

EX: 0

pc: 4194340

{'\$zero': 0, '\$t1': 0, '\$t2': 0, '\$t3': 0, '\$t4': 0, '\$t5': 8, '\$t6': 0, '\$t7': 0, '\$t8': 5, '\$t9': 8, '\$s0': 0, '\$s1': 0, '\$s4': 0, '\$s5': 0}

{'00000': '\$zero', '01001': '\$t1', '01010': '\$t2', '01011': '\$t3', '01100': '\$t4', '01101': '\$t5', '01110': '\$t6', '01111': '\$t7', '11000': '\$t8', '11001': '\$t9', '10000': '\$s0', '10001': '\$s1', '10100': '\$s4', '10101': '\$s5'}