Homework 6

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November 7, 2022

Problem 1

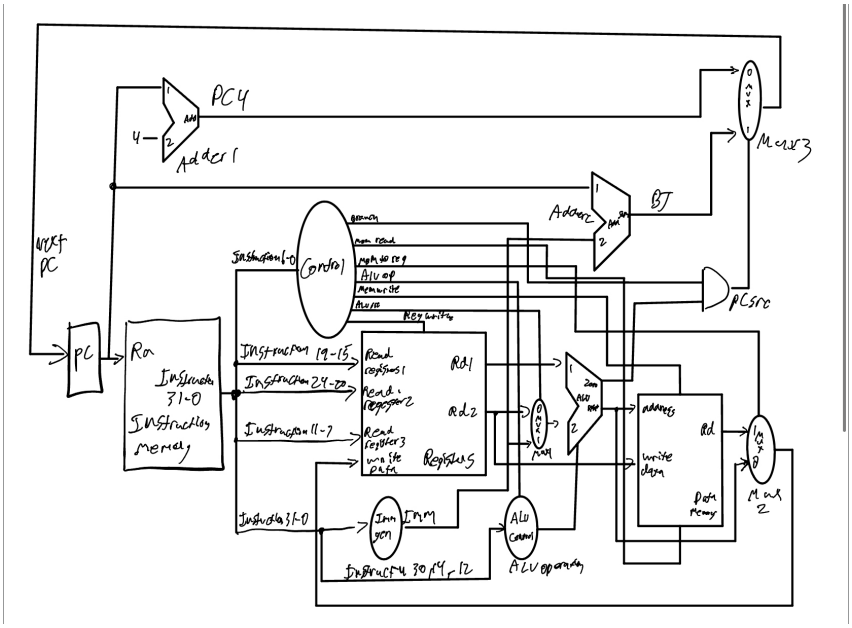
Assume the single-cycle RISC-V processor, as shown in Figure 4.21. Find the following signal values when the processor executes the instruction 0xFE542023 located at 0x00400200. Explain your answers. All signals generated by the main control.

Instruction: 0x00400200 : 0xFE542023
Binary: 01000000000001000000000 : 1111111 00101 01000 010 00000 0100011

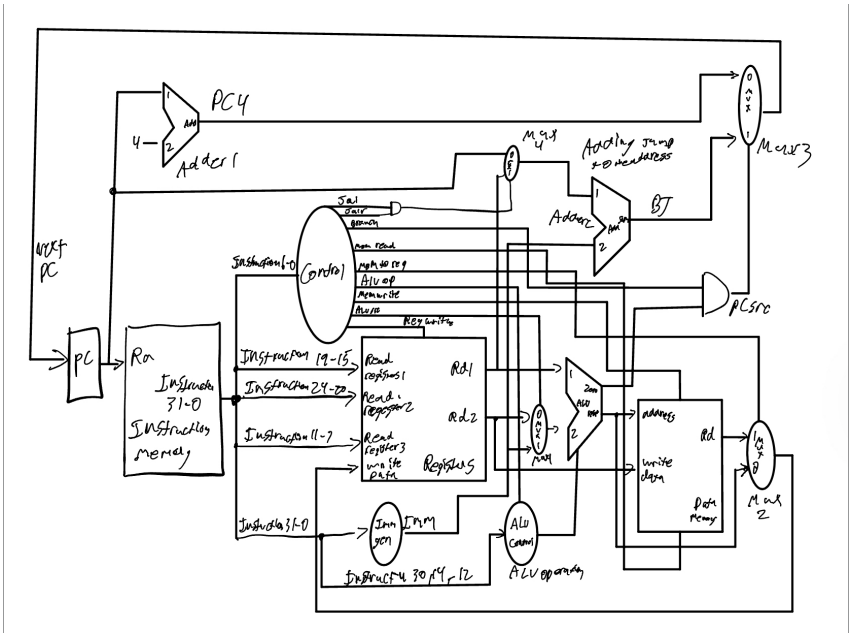
- opcode: instruction[6:0] = 0100011 = 0x23
- rs1: instruction[19:15] = 01000 = 0x8
- rs2: instruction[24:20] = 00101 = 0x5
- rd: instruction[11:7] = 00000 = 0x0
- Immediate: instruction[11:5, 4:0] = 1111 1110 0000 extended to 32 bits = 0xFFFFFFE0
- ALU operation: 0010
- BranchTarget: 0x00400200 + 0xFFFFFFE0 = 0x004001E0
- PCSrc: 0
- NextPC: 0x00400200 + 4 = 0x00400204

Problem 2

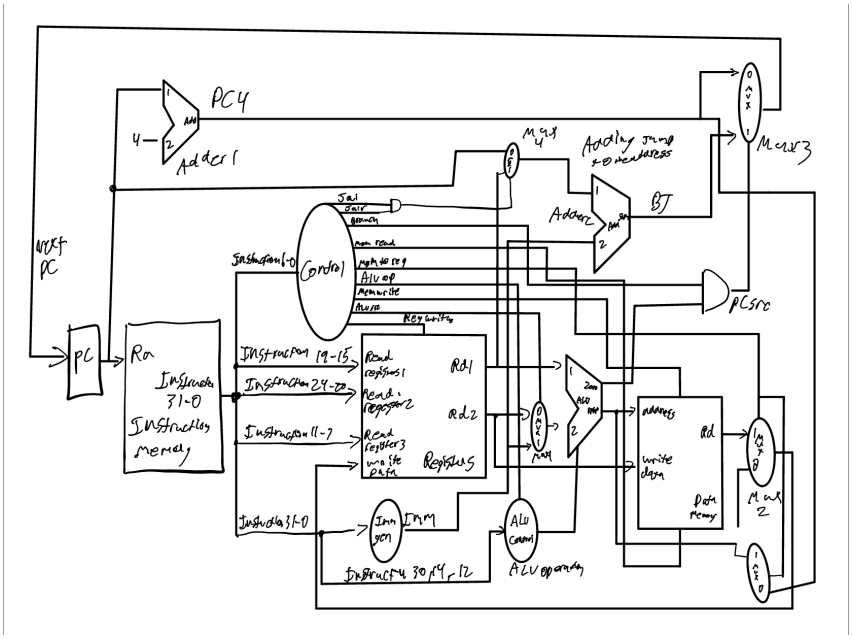
a.



b.



JAL: PC + Immediate JALR: RD (Read Data) + immediate c.



d.

Inst.	ALU Src	Memto Reg	Reg Write	Mem Read	Mem Write	Branch	J	JR
JAL	X	0	1	0	0	0	1	0
JALR	X	0	1	0	0	0	1	1