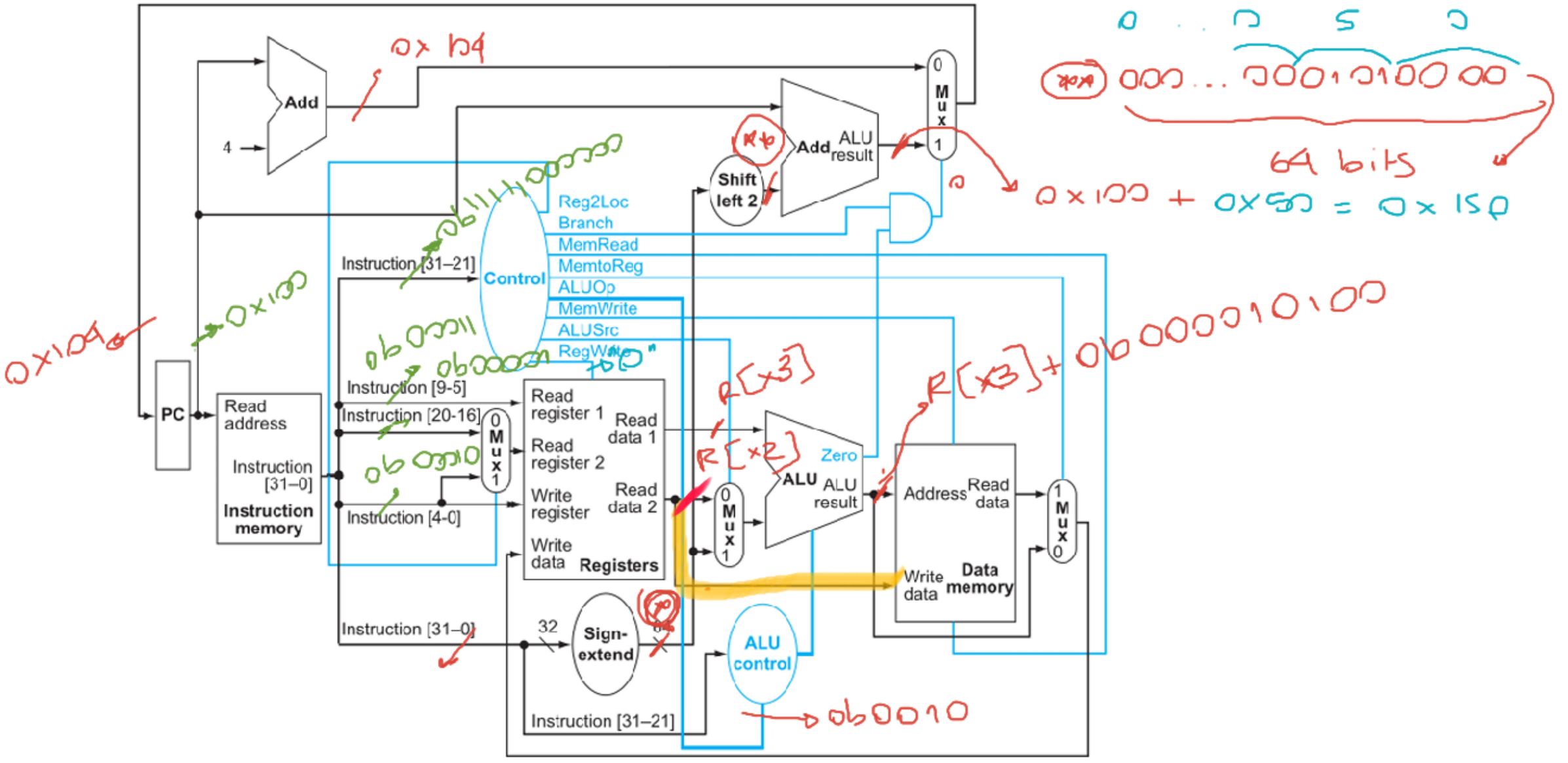
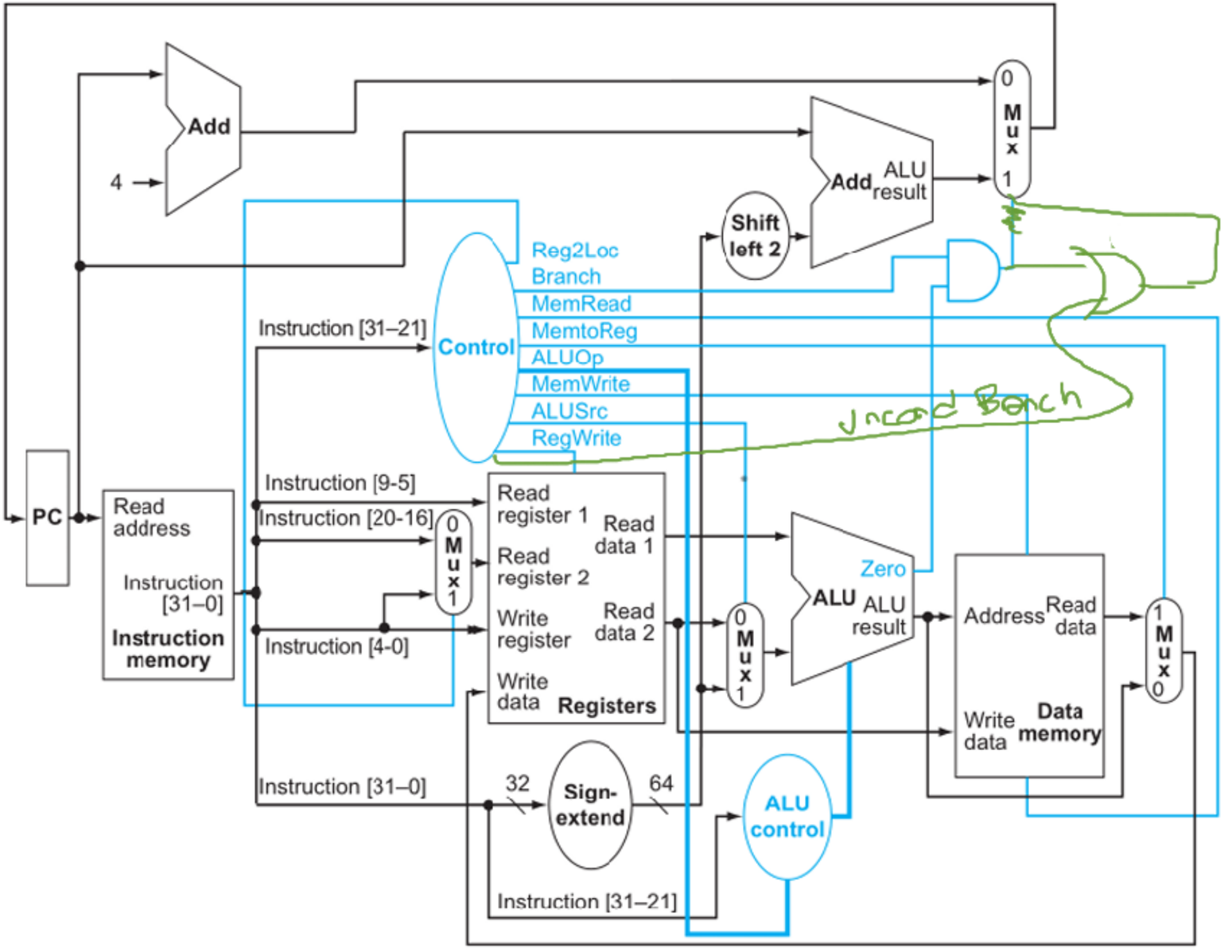
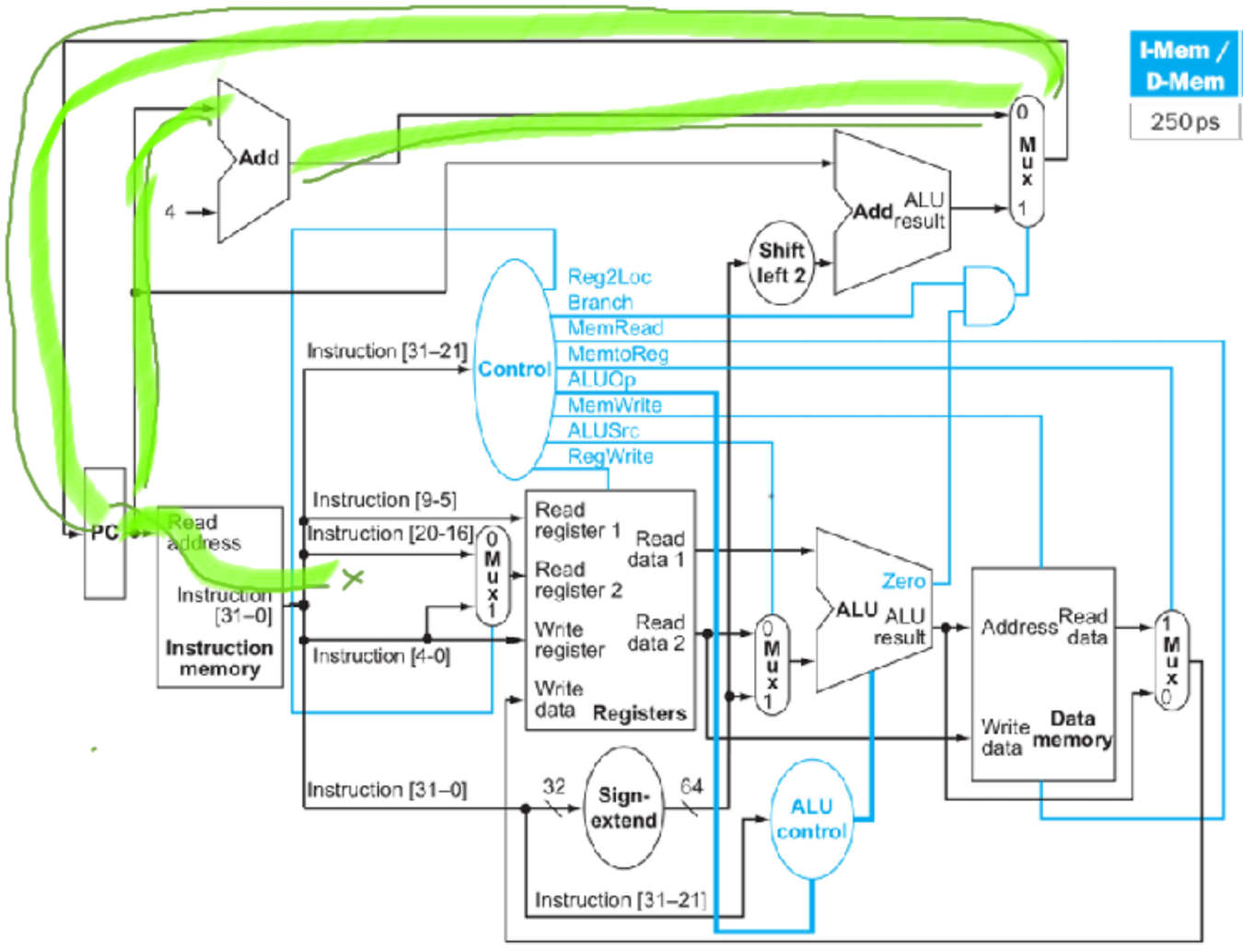
6

0xf8014062 ≡ 0b1111 1000 0000 0001 0100 0000 0110 0010




Add
4
0
M
u
x
1
Add
ALU result
Shift left 2
Reg2Loc
Branch
MemRead
MemtoReg
ALUOp
MemWrite
ALUSrc
RegWrite
Control
Instruction [31–21]
Instruction [9-5]
Instruction [20-16]
Instruction [4-0]
PC
Read address
Instruction [31–0]
Instruction memory
Read register 1
Read register 2
Write register
Write data
Read data 1
Read data 2
Registers
Zero
ALU
ALU result
Address
Read data
Write data
Data memory
Instruction [31–0]
32
Sign-extend
64
ALU control
Instruction [31–21]

8.1



I-Mem / D-Mem	Register File	Mux	ALU	Adder	Single gate	Register Read	Register Setup	Sign extend	Control	SI2
250 ps	150 ps	25 ps	200 ps	150 ps	5 ps	30 ps	20 ps	50 ps	50 ps	25 ps

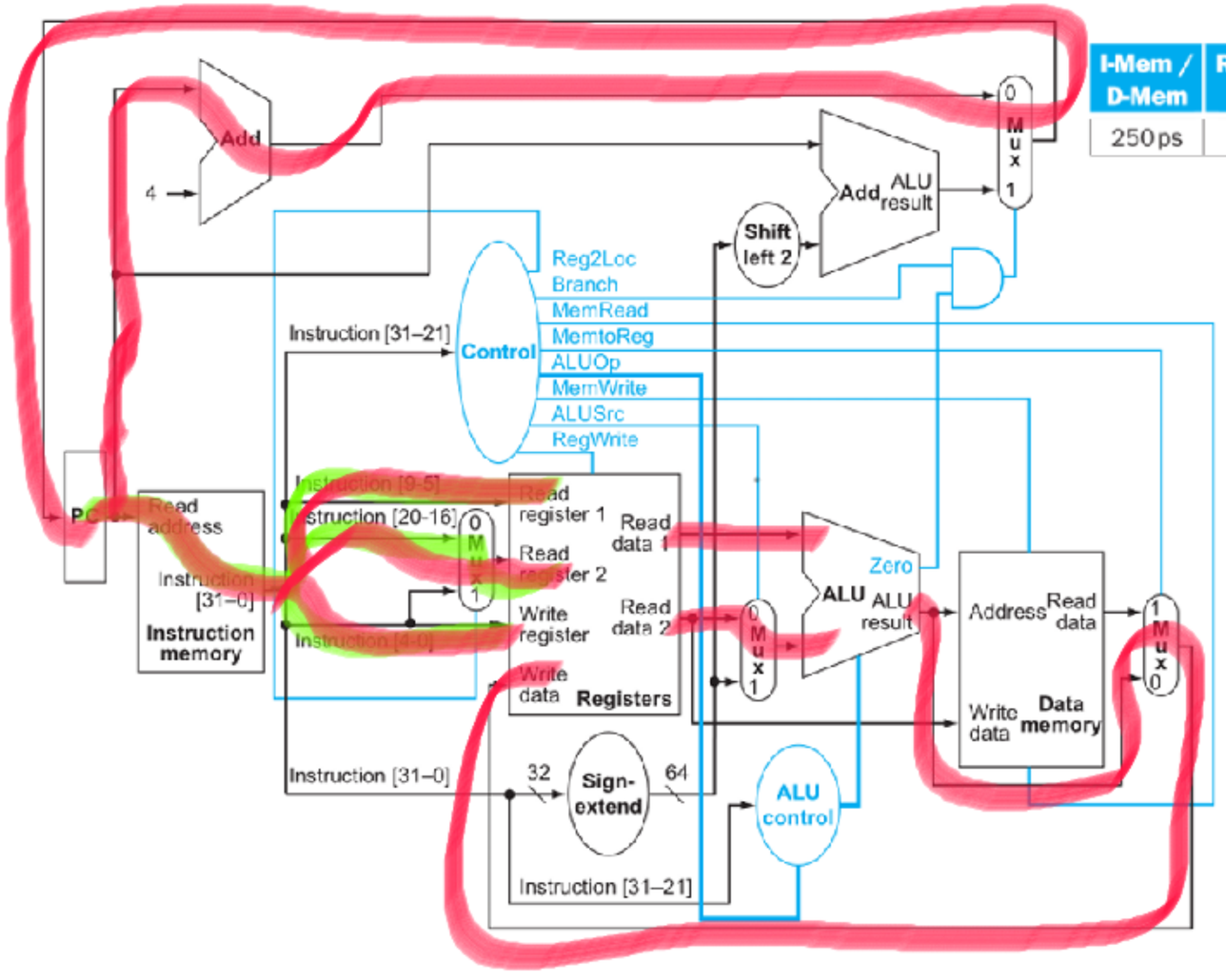
PCReg → I-mem ①

Adder → Mux → Reg Setup ②

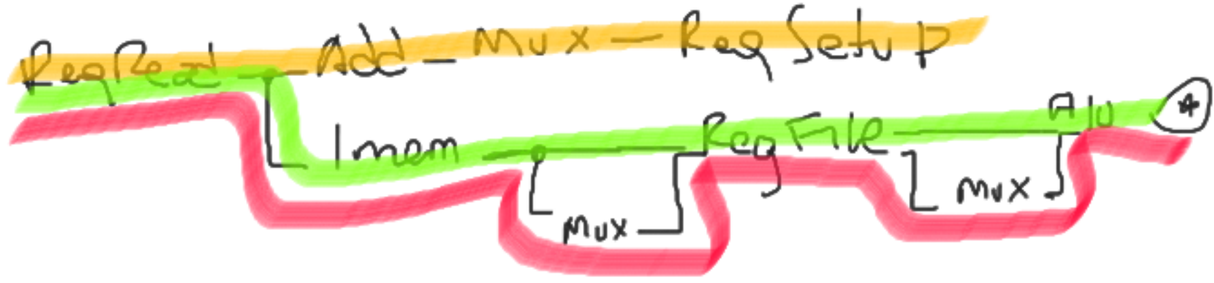
① 280 ps

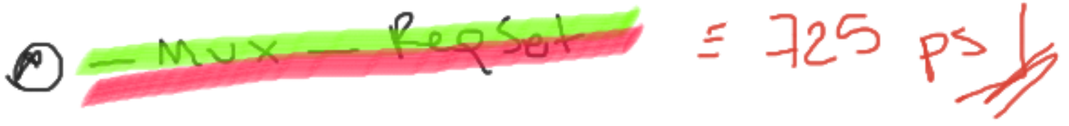
② 225 ps

8.2



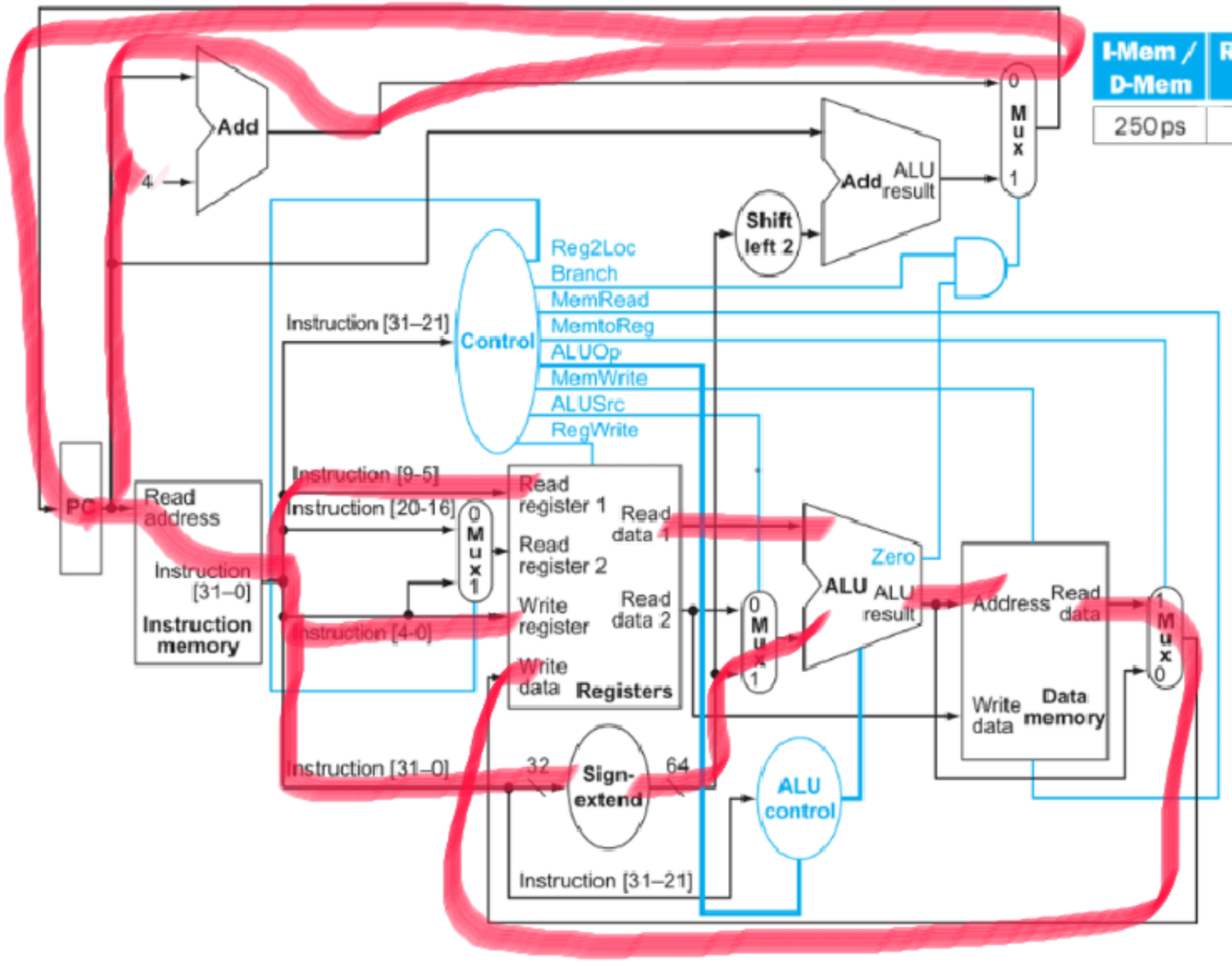
I-Mem / D-Mem	Register File	Mux	ALU	Adder	Single gate	Register Read	Register Setup	Sign extend	Control	SI2
250 ps	150 ps	25 ps	200 ps	150 ps	5 ps	30 ps	20 ps	50 ps	50 ps	25 ps





Tipo R

I-Mem / D-Mem	Register File	Mux	ALU	Adder	Single gate	Register Read	Register Setup	Sign extend	Control	SI2
250ps	150ps	25ps	200ps	150ps	5ps	30ps	20ps	50ps	50ps	25ps



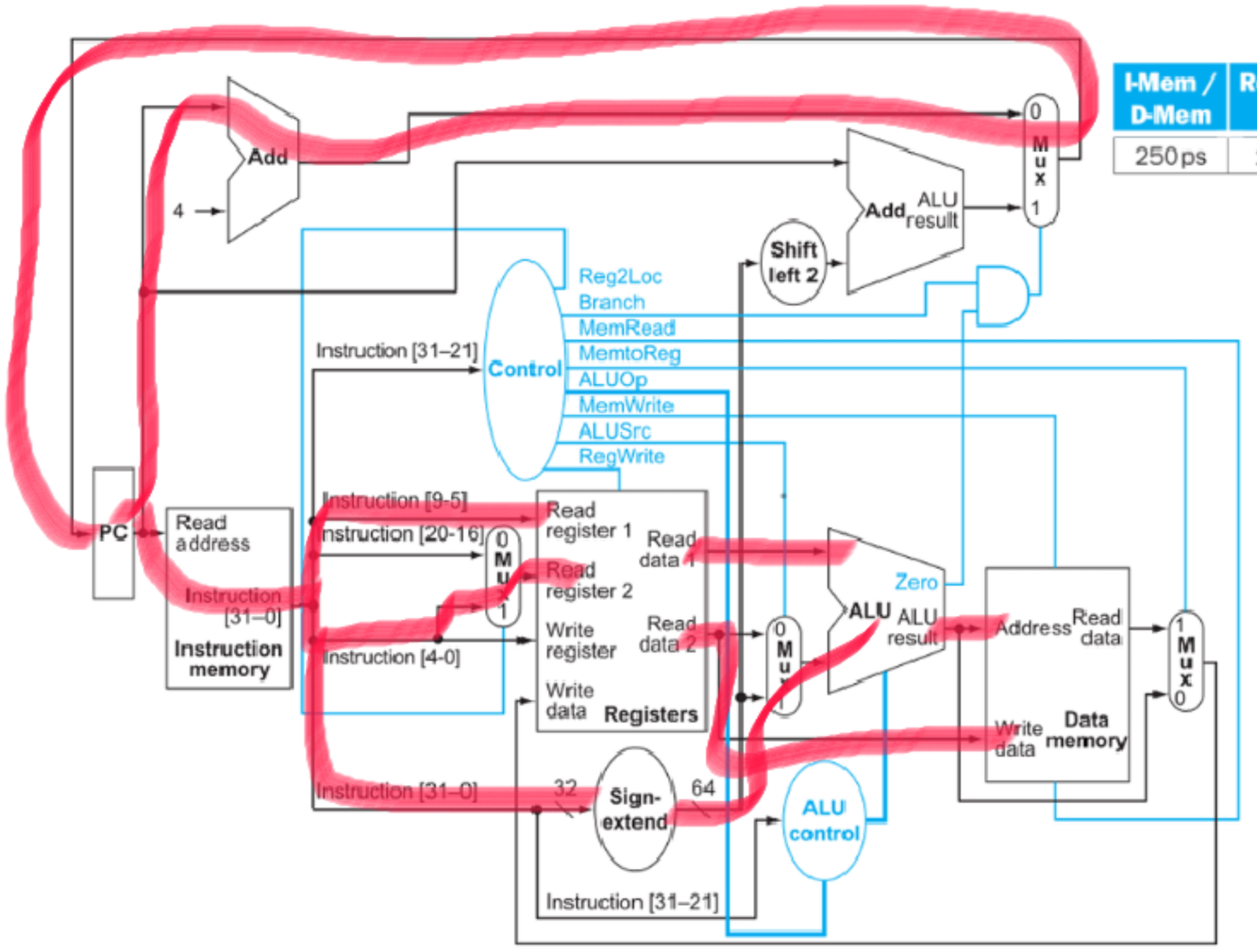
RegRead → Add → mux → RegSetup

Imem → RegFile → ALU → Dmem → mux → RegSetup

Imem → Sign-ext → mux

= 925ps (LDUR)

8.4

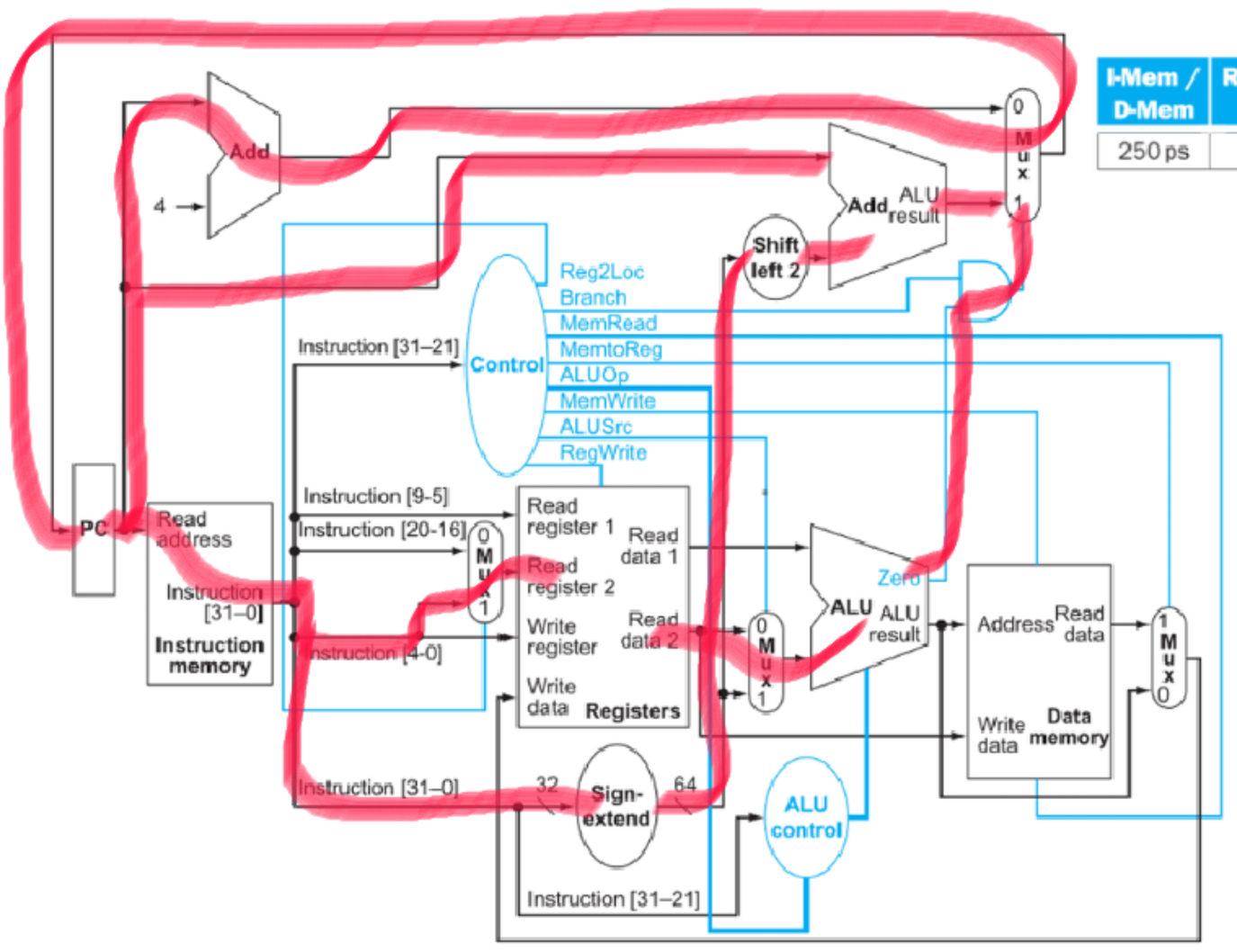


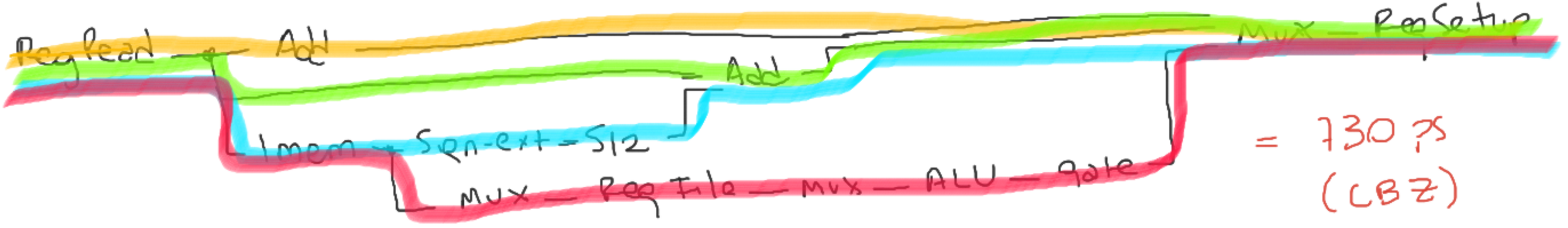
I-Mem / D-Mem	Register File	Mux	ALU	Adder	Single gate	Register Read	Register Setup	Sign extend	Control	SI2
250 ps	150 ps	25 ps	200 ps	150 ps	5 ps	30 ps	20 ps	50 ps	50 ps	25 ps

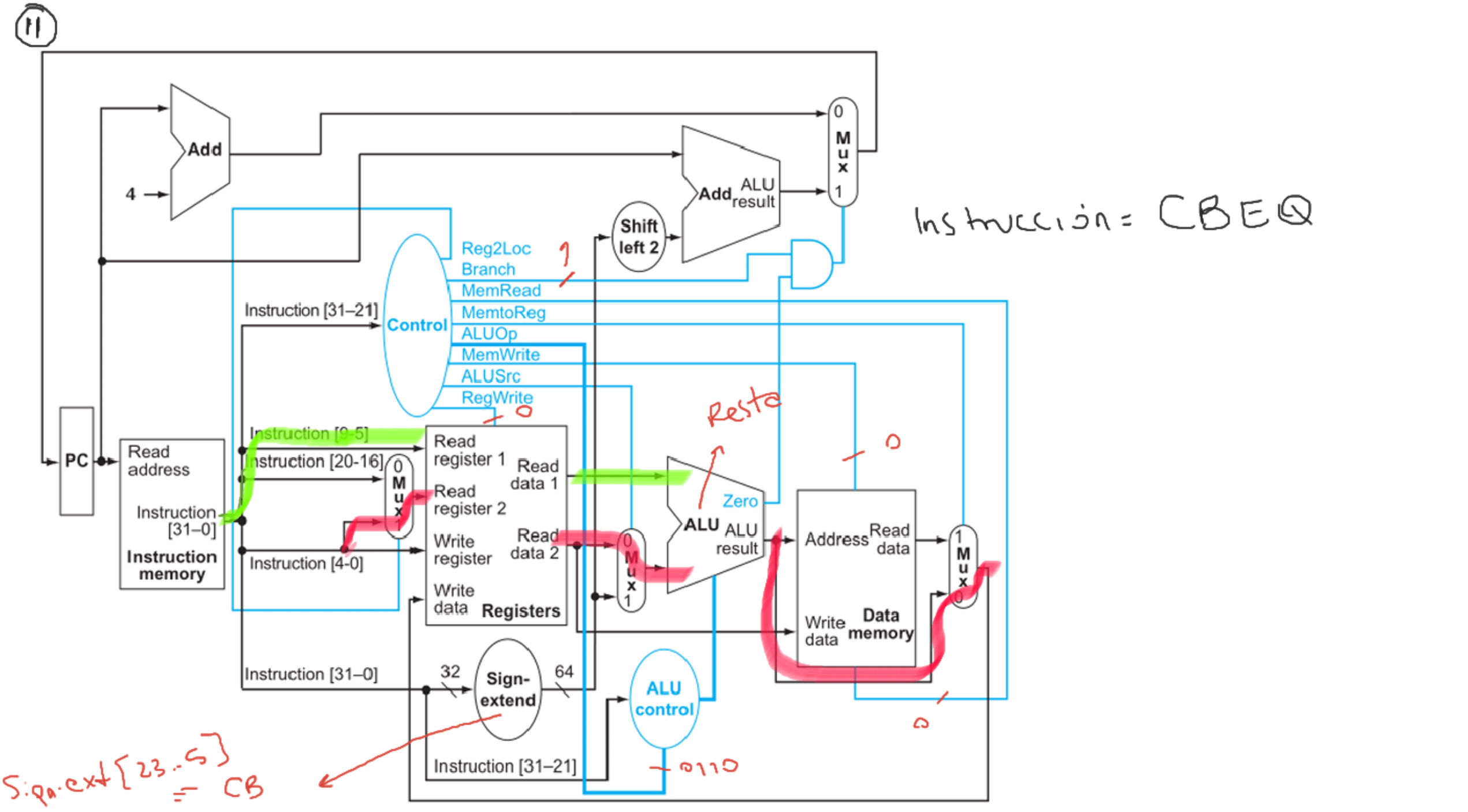
= 905 ps (STUR)

8.5

I-Mem / D-Mem	Register File	Mux	ALU	Adder	Single gate	Register Read	Register Setup	Sign extend	Control	SI2
250 ps	150 ps	25 ps	200 ps	150 ps	5 ps	30 ps	20 ps	50 ps	50 ps	25 ps






Add
4
Add
ALU result
Shift left 2
0 M u x 1
Reg2Loc
Branch
MemRead
MemtoReg
ALUOp
MemWrite
ALUSrc
RegWrite
Control
Instruction [31–21]
PC
Read address
Instruction [31–0]
Instruction memory
Instruction [9-5]
Instruction [20-16]
Instruction [4-0]
Read register 1
Read register 2
Write register
Write data
Read data 1
Read data 2
Registers
ALU
Zero
ALU result
Address
Read data
Write data
Data memory
Instruction [31–0]
32
Sign-extend
64
ALU control
Instruction [31–21]
Instrucción = CBEQ
Resta
Sign.ext[23..5] = CB