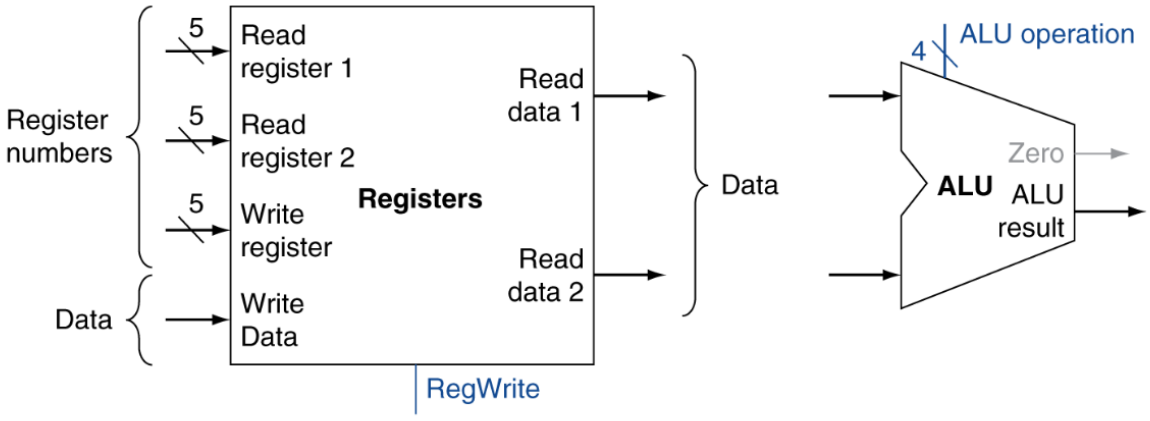
R-Format Instructions

- Read two register operands
- Perform arithmetic/logical operation
- Write register result



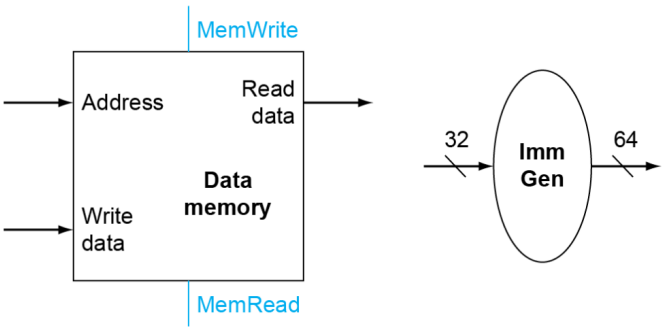
a. Registers

b. ALU

ld x22, 16(x21)

Load/Store Instructions

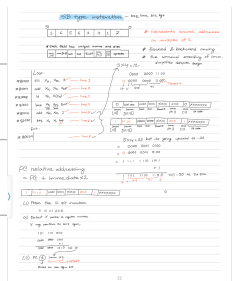
- Read register operands
- Calculate address using 12-bit offset
  - Use ALU, but sign-extend offset
- Load: Read memory and update register
- Store: Write register value to memory

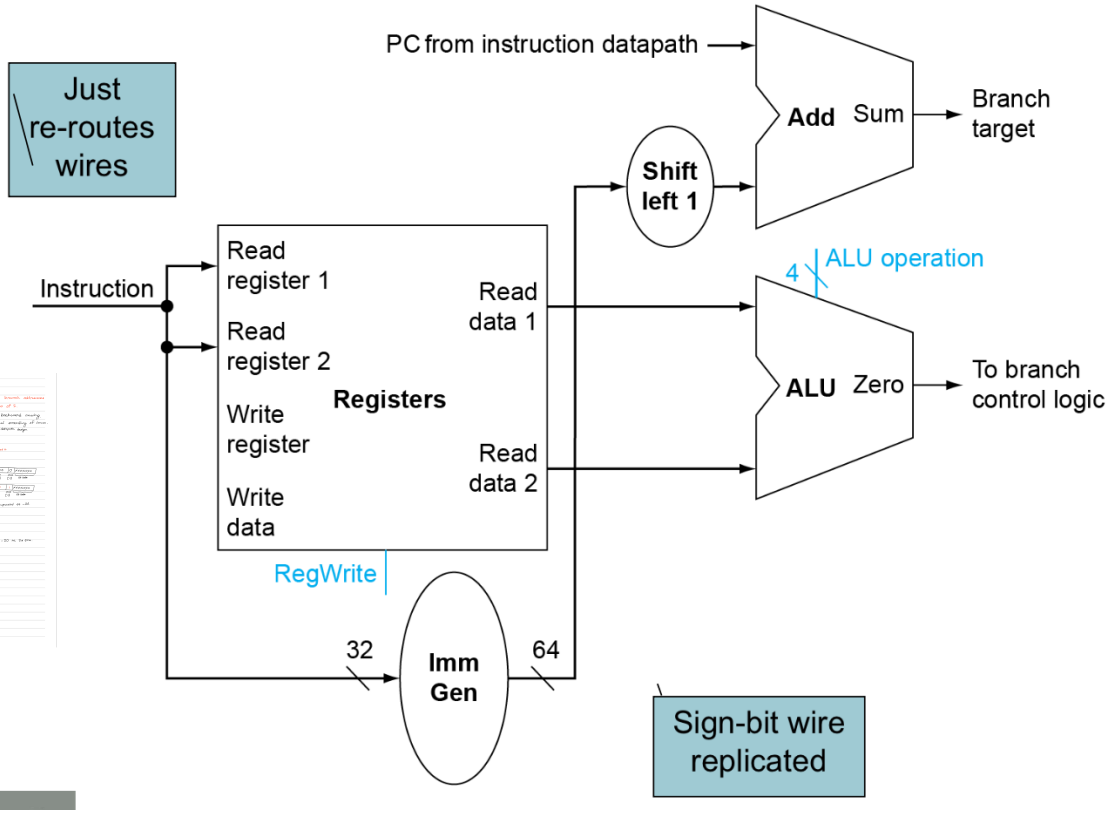


a. Data memory unit

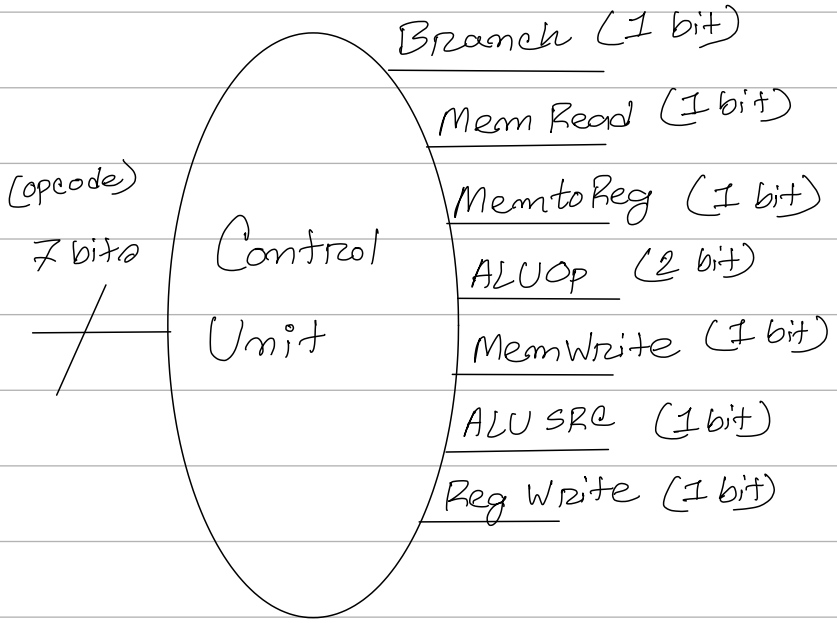
b. Immediate generation unit

Branch Instructions





Control Unit



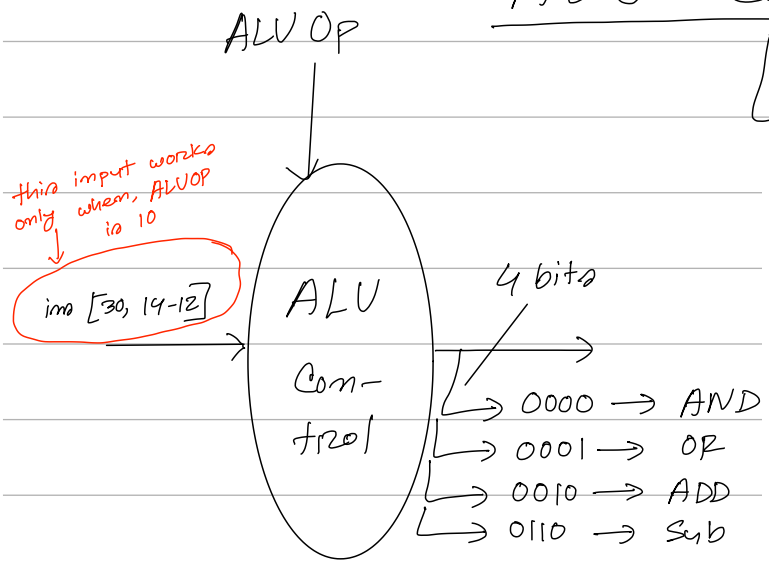
ALU Op => 00 → load / Store / Addi

01 → Beq

10 → R type

ALU Control

↳ it controls ALU's operations.



opcode	ALUOp	Operation	ALU function	ALU control
ld	00	load register	add	0010
sd	00	store register	add	0010
beq	01	branch on equal	subtract	0110
R-type	10	add	add	0010
		subtract	subtract	0110
		AND	AND	0000
		OR	OR	0001