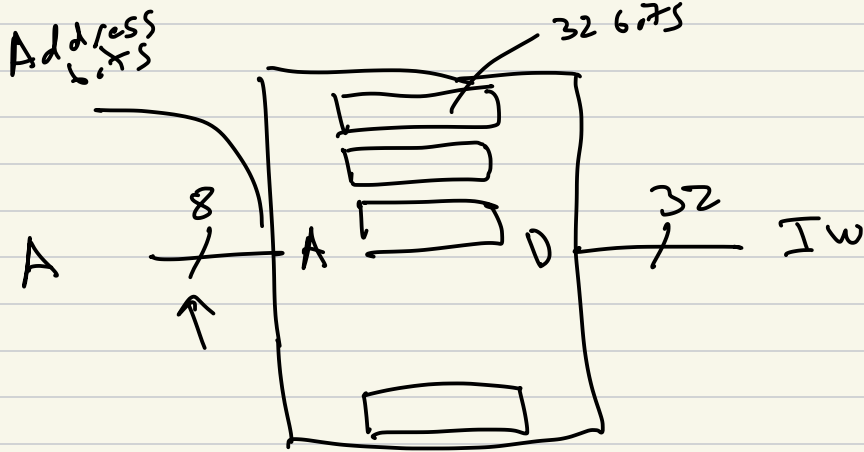


# CS 315-01 Instruction Memory and Decoding

- Instruction Memory (ROM)  
Decoder  
Priority Encoder  
Instruction Decoder

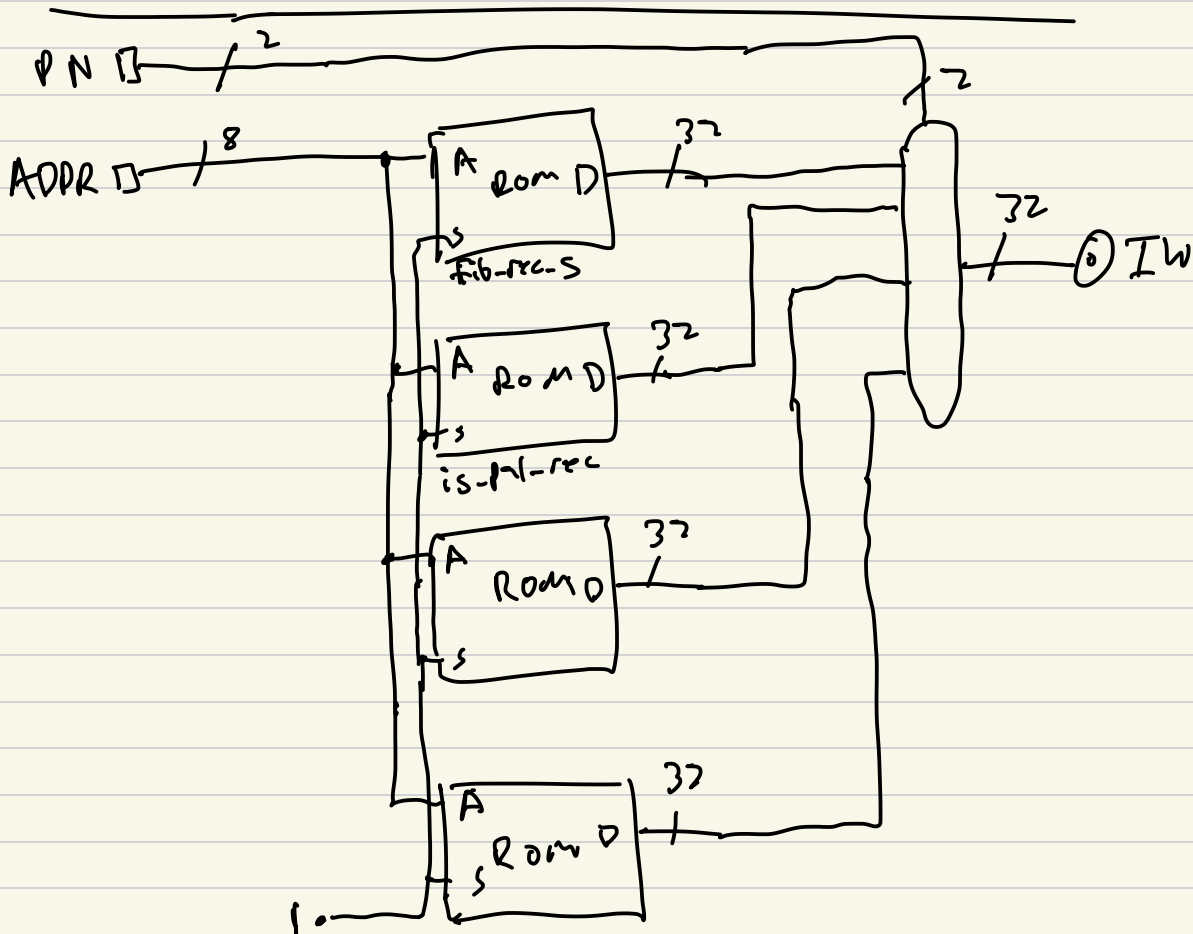
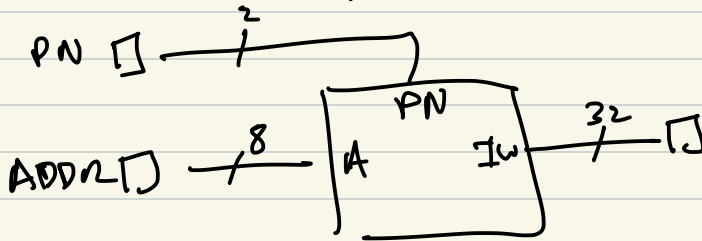
ROM Read Only Memory



$$2^8 = 256$$

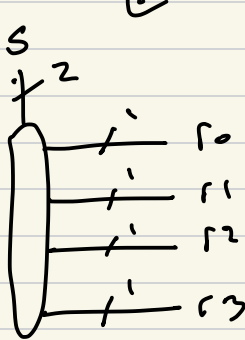
Instruction Memory

PN = Program Num



# Decoder

2 to 4 decoder

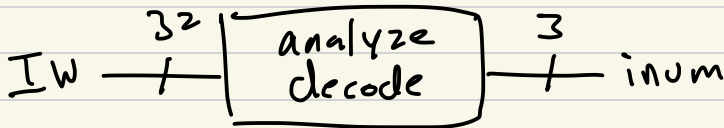


| $s_1$ | $s_0$ | $r_3$ | $r_2$ | $r_1$ | $r_0$ |
|-------|-------|-------|-------|-------|-------|
| 0     | 0     | 0     | 0     | 0     | 1     |
| 0     | 1     | 0     | 0     | 1     | 0     |
| 1     | 0     | 0     | 1     | 0     | 0     |
| 1     | 1     | 1     | 0     | 0     | 0     |

$$r_0 = (\bar{s}_1 \cdot \bar{s}_0) \quad r_2 = (s_1 \cdot \bar{s}_0)$$

$$r_1 = (\bar{s}_1 \cdot s_0) \quad r_3 = (s_1 \cdot s_0)$$

## Instruction Decoder (analyze\_decode)



0 i-type

4 b-type

1 r-type

5 jal

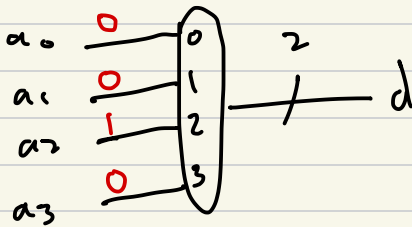
2 load

6 j

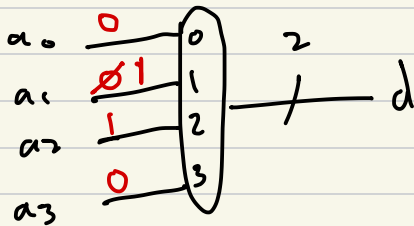
3 s-type

7 jalr

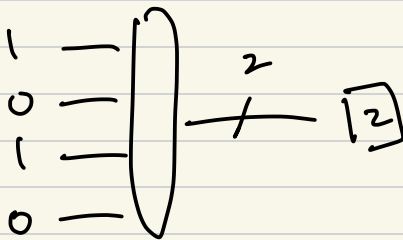
# Encoder



| $a_3$ | $a_2$ | $a_1$ | $a_0$ | $d_1$ | $d_0$ |   |
|-------|-------|-------|-------|-------|-------|---|
| 0     | 0     | 0     | 1     | 0     | 0     | 0 |
| 0     | 0     | 1     | 0     | 0     | 1     | 1 |
| 0     | 1     | 0     | 0     | 1     | 0     | 2 |
| 1     | 0     | 0     | 0     | 1     | 1     | 3 |



## Priority Encoder



# analyze\_decode

## Priority Encoder

0 i-type  
1 r-type

