

第八周

2. I1: IF ID EX MEM WB

I2: IF ID EX MEM WB

I3: (RAN) IF ID S S EX MEM WB

I4: IF ID EX MEM WB

I5: IF ID S S S EX MEM WB

I6: IF ID S S S S EX MEM WB

$$4. 1) T_A = 1ns + \frac{1ns}{5} = 1.2ns$$

$$T_B = 0.6ns + \frac{3 \times 0.6ns}{8} = 0.825ns$$

$$S = \frac{T_A}{T_B} = 1.455$$

$$2) CPI_A = \frac{5 \times 1ns + 1ns + 5 \times 20\% \times 5\% \times 2 \times 1ns}{5 \times 1ns} = 1.22$$

$$CPI_B = \frac{12 \times 0.6ns + \frac{12}{8} \times 3 \times 0.6ns + 12 \times 20\% \times 5\% \times 5 \times 0.6ns}{12 \times 0.6ns}$$

$$= 1.38$$

6. lld 与 addi 写后读。

addi 与 sd 写后读。

sd 与 addi 存储后读。

addi 与 sub 写后读。

bnez 与 sub 写后读。

2) Id: IF ID EX MEM WB

addi: IF ID S S EX MEM WB

sd: IF ID S S S S EX MEM WB

addi: IF ID S S S S S EX MEM WB

sub: IF ID S S S S S S S EX MEM WB

bnez: IF ID S S S S S S S S EX MEM WB

$$n = 19 \times 20 = 380$$

7. 1)  $ld$ : IF ID EX MEM WB

addi: IF ID S EX MEM WB

sd: IF ID S EX MEM WB

addi: IF ID S EX MEM WB

sub: IF ID S EX MEM WB

bne &: IF ID S EX MEM WB

$$n = 11 \times 20 = 220$$

$$2) n = (11 - 5) \times 20 + 5 = 125$$

8. 1)  $ld$ : IF<sub>1</sub> IF<sub>2</sub> ID<sub>1</sub> ID<sub>2</sub> EX<sub>1</sub> EX<sub>2</sub> M<sub>1</sub> M<sub>2</sub> WB<sub>1</sub> WB<sub>2</sub>

addi: IF<sub>1</sub> IF<sub>2</sub> ID<sub>1</sub> ID<sub>2</sub> S S S EX<sub>1</sub> EX<sub>2</sub> M<sub>1</sub> M<sub>2</sub> WB<sub>1</sub> WB<sub>2</sub>

sd: IF<sub>1</sub> IF<sub>2</sub> ID<sub>1</sub> ID<sub>2</sub> S S S EX<sub>1</sub> EX<sub>2</sub> M<sub>1</sub> M<sub>2</sub> WB<sub>1</sub> WB<sub>2</sub>

addi: IF<sub>1</sub> IF<sub>2</sub> ID<sub>1</sub> ID<sub>2</sub> S S S EX<sub>1</sub> EX<sub>2</sub> M<sub>1</sub> M<sub>2</sub> WB<sub>1</sub> WB<sub>2</sub>

sub: IF<sub>1</sub> IF<sub>2</sub> ID<sub>1</sub> ID<sub>2</sub> S S S S EX<sub>1</sub> EX<sub>2</sub> M<sub>1</sub> M<sub>2</sub> WB<sub>1</sub> WB<sub>2</sub>

bne &: IF<sub>1</sub> IF<sub>2</sub> ID<sub>1</sub> ID<sub>2</sub> S S S S S EX<sub>1</sub> EX<sub>2</sub> M<sub>1</sub> M<sub>2</sub> WB<sub>1</sub> WB<sub>2</sub>

$$n = (21 - 14) \times 20 + 14 = 154$$

$$2) ⑥ CPI = \frac{19}{6}$$

$$⑦ CPI_{I1} = \frac{11}{11}$$

$$CPI_{I2} = \frac{125}{6 \times 20} = \frac{25}{24}$$

$$⑧ CPI = \frac{154}{6 \times 20} = \frac{77}{60}$$

Date.

Page.

19. 1) add addi ld sd bne jal jalr  
是 否 是 是 否 否

2) IF ID ID EX MEM WB

IF S ID ID S EX MEM WB

IF S S ID S S EX MEM WB

IF S S ID S S S EX MEM WB

IF S S ID ID S S S EX MEM WB

$n = 15$

3) IF ID EX MEM WB

IF ID S S EX MEM WB

IF ID S S S EX MEM WB

IF ID S S S S EX MEM WB

IF ID S S S S S EX MEM WB

$n = 14$