

$$1. (1) T_{cycle} = (T_{cycle} + 0.1ns \times 4) \div 5 = 1.48ns$$

$$(2) S = \frac{T_{cycle}}{T_{cycle}} = \frac{1.48}{7} = 0.21$$

$$(3) S' = \frac{1}{K} = \frac{1}{5} = 0.2$$

2. I1 I2 I3 I4 I5 I6

I1 -

I2 X -

I3 WAW RAW -

I4 X WAW WAR -

I5 RAW RAW RAW RAW -

I6 X X X X WAW -

$$4. (1) S = \frac{T_B}{T_A} \times \frac{CPI_B}{CPI_A} = \frac{\frac{1}{5}}{\frac{0.6}{12}} \times \frac{\frac{1}{5}}{\frac{1}{8}} = \frac{22}{5}$$

$$(2) CPI_A = \frac{5}{1 \times (2+1)} \times 5\% \times 20\% = \frac{1}{6}$$

$$CPI_B = \frac{24}{0.6 \times (3+1)} \times 5\% \times 20\% = \frac{1}{10}$$

for sol

6. (1) ld 和 addi 的 a₁ 会发生 RAW.

sol 和 addi 的 a₂ 会发生 RAW, WAW

addi 和 sub 的 a₂ 会发生 RAW.

No. _____

Date _____

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

ld a1.0(a2) IF ID ZX M2M WB

addi a1.a1.1 IF ID s s ZX M2M WB

sd a1.0(a2) IF s s ID ZX M2M WB

addi a2.a2.4 IF ID s s ZX M2M WB

sub a1.a3.a2 IF s s ID s s ZX M2M WB

bnez a1. Loop IF s s ID s s ZX M2M WB

$$20 \times 18 = 360 \uparrow$$

7. (1) 1 2 3 4 5 6 7 8 9 10

ld a1.0(a2) IF ID ZX M2M WB

addi a1.a1.1 IF ID ZX M2M WB

sd a1.0(a2) IF ID ZX M2M WB

addi a2.a2.4 IF ID ZX M2M WB

sub a1.a3.a2 IF ID ZX M2M WB

bnez a1. Loop IF ID ZX M2M WB

$$10 \times 20 = 200 \uparrow$$

(2)

8. 11 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

lal a1,0(a2) IF₁ IF₂ ID₁ ID₂ ZX₁ ZX₂ M₁ M₂ WB₁ WB₂

addi a1,a1,1 IF₁ IF₂ ID₁ ID₂ s s s ZX₁ ZX₂ M₁ M₂ WB₁ WB₂

sol a1,0(a2) IF₁ IF₂ ID₁ s s s ID₂ s s s ZX₁ ZX₂ M₁ M₂ WB₁ WB₂

addi a2,a2,4 IF₁ IF₂ s s s ID₁ s s s ID₂ s s s ZX₁ ZX₂

sub a4,a3,a2 IF₁ s s s IF₂ s s s ID₁ s s s ID₂ s

bneq a4,Lop IF₁ s s s IF₂ s s s ID₁ s

19 20 21 22 23 24 25 26 27 28 29 30

addi a2,a2,4 M₁ M₂ WB₁ WB₂

sub a4,a3,a2 s s ZX₁ ZX₂ M₁ M₂ WB₁ WB₂

bneq a4,Lop s s ID₂ s s s ZX₁ ZX₂ M₁ M₂ WB₁ WB₂

$$30 \times 20 = 600$$

$$(2) CPI_6 = 3$$

$$CPI_7 = \frac{5}{3}$$

$$CPI_8 = 5$$