

## 第8周作业

I<sub>2</sub> I<sub>1</sub> I<sub>2</sub> I<sub>3</sub> I<sub>4</sub> I<sub>5</sub> I<sub>6</sub>

I<sub>1</sub> -

I<sub>2</sub> / -

I<sub>3</sub> WAW RAW -

I<sub>4</sub> / WAW RAW -

I<sub>5</sub> RAW RAW / RAW -

I<sub>6</sub> / / / / WAW -

$$4 (1) \text{ 加速比} = \frac{t_1}{t_2} = \frac{CPI_1 \times T_1}{CPI_2 \times T_2} = \left( \frac{\left(\frac{12}{8} \times 3 + 12\right) \div 12 \times 0.6 \text{ ns}}{\frac{6}{3} \times 1 \text{ ns}} \right)^{-1} = 1.45$$

加速了约 45%

$$(2) CPI_1 = [(5+1) \times T + 5 \times 20\% \times 5\% \times 2T] \div 5T = 1.22$$

$$CPI_2 = [(12 + 12 \times \frac{3}{8}) \times T + 12 \times 20\% \times 5\% \times 5T] \div 12T = 1.425$$

6 (1) 该指令从上到下标号为 1 ~ 6

1,2 RAW(a<sub>1</sub>) 1,3 WAW (a<sub>1</sub>) 2,3 WAW 或 WAR

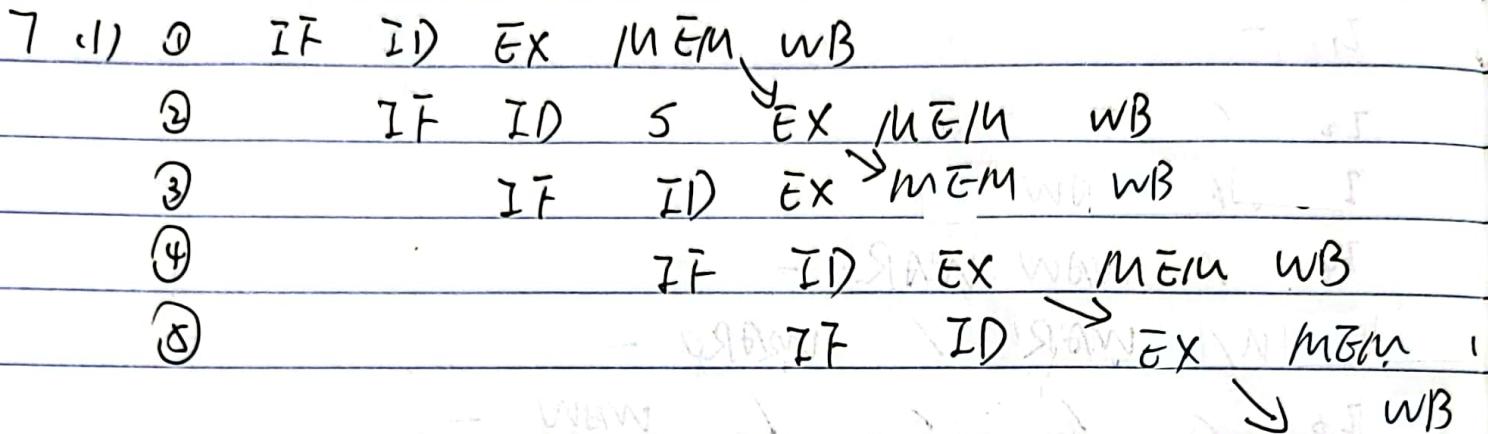
3,4 WAR (a<sub>2</sub>) 4,5 RAW (a<sub>2</sub>) 5,6 RAW (a<sub>4</sub>) (a<sub>1</sub>)

(2) 从第 2 条指令 ID 开始

sd a <sub>1</sub> ,a <sub>2</sub> )	if ID EX S S S MEM WB
add:a <sub>3</sub> ,a <sub>2</sub> ,t	IF [EX MEM WB] S S → t
sub a <sub>4</sub> ,a <sub>3</sub> ,a <sub>2</sub>	IF ID S S EX MEM WB
bnez a <sub>4</sub> ,loop	IF ID S S S S EX MEM WB



共 14 个周期



⑥ IF ID EX MEM WB

(2)  $T = 5 + (N-k) + k \times (l+1) + l = 6 + 6 - 2 = 10$

8 (1) 从第③项开始

③ IF<sub>1</sub> IF<sub>2</sub> ID<sub>1</sub> ID<sub>2</sub> S S S M<sub>1</sub> M<sub>2</sub> WB<sub>1</sub> WB<sub>2</sub>

④ 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>

⑤ IF<sub>1</sub> IF<sub>2</sub> ID<sub>1</sub> ID<sub>2</sub> 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>

⑥ IF<sub>1</sub> IF<sub>2</sub> ID<sub>1</sub> ID<sub>2</sub> 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>

共 17 个周期

(2) CP I<sub>1</sub> =  $\frac{4+5+2+4+2}{6} + 6 + 5 - 1 \div 5 = 2.57$

CP I<sub>2</sub> =  $\frac{1}{6} + 5 + 6 - 1 \div 5 = 2.03$

CP I<sub>3</sub> =  $\frac{4+3+1+2}{6} + 6 + 10 - 1 \div 10 = 1.67$



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19 (1) 是 是 是 是 否 否 是

(2) ① IF ID<sub>1</sub> ID<sub>2</sub> EX MEM WB

② IF ID<sub>1</sub> ID<sub>2</sub> S S EX MEM WB

③ IF ID EX MEM WB

④ IF ID EX MEM WB

⑤ IF ID S EX MEM WB

周期数 10 WB

(3) ① IF ID<sub>1</sub> ID<sub>2</sub> EX MEM WB

② IF ID<sub>1</sub> S S EX MEM WB

③ IF ID EX MEM WB

④ IF ID EX MEM WB

⑤ IF ID EX MEM WB

周期数 9



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