

1. 解: (1) 对于耗时最高的流水级MEM,
所需时间为 $2ns + 0.1ns = 2.1ns$

\therefore 5级流水级化后的处理器时钟
周期应为 $2.1ns$

(2) 处理 N 条指令时

$$\frac{CPI_{pipe}}{CPI_{cycle}} = \frac{N+4}{N} = \frac{N+4}{N}$$

$$\text{且 } \frac{T_{pipe}}{T_{cycle}} = \frac{2.1ns}{7.5ns}$$

$$\therefore S = \frac{N+4}{N} \cdot \frac{2.1}{7.5} \text{ 令 } N \rightarrow \infty,$$

$$\text{得: } S = \frac{2.1}{7.5} = 0.28$$

$$\therefore \text{加速比为 } 1:S = \frac{25}{7} = 3.57$$

(3) 拥有无限多个流水级时,

$$T_{pipe} = \frac{2ns}{N} + 0.1ns = 0.1ns \quad (N \rightarrow \infty)$$

$$\text{此时加速比为 } 1:\frac{0.1}{7.5} = 75$$