

第7次作业 T₁

T₁ (1) 5级流水化后的处理器时钟周期应为 $T_{\text{pipe}} = \underbrace{2ns + 0.1ns}_{\text{最慢的一级}} = 2.1ns$

(2) 加速比 $\frac{1}{S} = \frac{T_{\text{pipe}} \times CPI_{\text{pipe}}}{T_{\text{cycle}} \times CPI_{\text{cycle}}} = \frac{2.1ns}{7ns} \cdot \frac{N+k-1}{N} \cdot \frac{\text{令 } N \gg k-1}{\text{约去}} \frac{2.1}{7} = 0.3 \text{ 倍}$

即 $S \approx 3.3 \text{ 倍}$

(3) 加速比 $\frac{1}{S} = \frac{T_{\text{pipe}}}{T_{\text{cycle}}} \cdot \frac{N+k-1}{N}$ 当 $k \rightarrow \infty$ 时 由于 $\frac{T_{\text{pipe}}}{T_{\text{cycle}}} = \frac{\frac{7ns}{k} + 0.1ns}{7ns}$

故 $S = (\frac{1}{k} + \frac{1}{70}) \cdot \frac{N+k-1}{N} = (\frac{N-1}{N} \cdot \frac{1}{k} + \frac{1}{70} \cdot \frac{k}{N}) + \frac{1}{N} + \frac{N-1}{N} \cdot \frac{1}{70}$

$= (\frac{N-1}{N} \cdot \frac{1}{k} + \frac{1}{70N} \cdot k) + \frac{N+69}{70N} \rightarrow \infty \text{ as } k \rightarrow \infty$

即无限多流水级时, 用时更长.

即 $S \rightarrow 0 \text{ as } k \rightarrow \infty$