

$$1. (1). T_{\text{cycle}} = 1ns + 1.5ns + 1ns + 2ns + 1.5ns + 0.1ns \times 5 \\ = 7.5ns$$

$$(2). T_{\text{pipe}} = 2ns + 0.1ns = 2.1ns$$

$$S = \frac{2.1ns}{7ns} \times \frac{N+4}{N} \quad \text{加速比} = \frac{7}{2.1} \times \frac{N}{N+4}$$

$$N \gg 4 \text{ 时} \quad \text{加速比} \approx 3.33$$

$$(3). k \rightarrow \infty \text{ 时} \quad T_{\text{pipe}} = 0.1ns$$

$$S = \frac{0.1ns}{7ns} \times \frac{N+k-1}{N} \quad \text{加速比} = 70 \times \frac{N}{N+k-1}$$

$$\text{仍考虑 } N \gg k-1 \quad \therefore \text{加速比极限} \approx 70$$

