5.1 (12)

CLK = set-up + CLK-to-Q + 关键路径延时

1. 2ns + 0.1ns = 2.1ns

2. $S = \frac{T_{old}}{T_{new}} = \frac{CPI_{pipe} \times T_{pipe} \times N_{instruction}}{CPI_{cycle} \times T_{cycle} \times N_{instruction}} = \frac{T_{pipe} \times CPI_{pipe}}{T_{cycle} \times CPI_{cycle}}$

$= \frac{2.1 \times 1+5-1}{7 \times 1} \times 5$ $\left[\frac{2.1}{7} \times \frac{N+k-1}{N} = \frac{21}{7} \times \frac{1}{5} = \frac{3}{50}\right] \times$

$\frac{7}{21} \times \frac{N+k-1}{N} \approx \frac{7}{21} \times 5 = \frac{50}{3}$

3. $k \to \infty$ $T_{pipe} = \frac{7}{k} + 0.1$

$\left[S = \frac{\frac{7}{k} + 0.1}{7} \times \frac{k+1-1}{1}\right] \times$

$S = \frac{7}{\frac{7}{k} + 0.1} \times \frac{N+k-1}{N} \approx \frac{7}{\frac{7}{k} + 0.1} \times k = \frac{7k^2}{7 + 0.1k} \to \infty$