

#### 4.4 第3章

1. 1)  $T_{pipe} = t_{MEM} + t_d = 2.1 ns$

2)  $T_{old} = 1 + 1.5 + 1 + 2 + 1.5 = 7 ns$  设一个程序中有  $N$  条指令

$T_{old} = N \cdot T_{cycle} = 7N (ns)$

$T_{new} = (N+5-1) \cdot T_{pipe} = 2.1(N+4) ns$

$\therefore S_{all} = \frac{T_{old}}{T_{new}} = \frac{7N}{2.1N+8.4} \xrightarrow{N \gg 4} \frac{7}{2.1} = \frac{T_{cycle}}{T_{pipe}} = 3.33$

3) 当流水线级趋近于无限多个时,  $T_{pipe} \rightarrow t_d = 0.1 ns$

$\therefore S_{max} = 70$