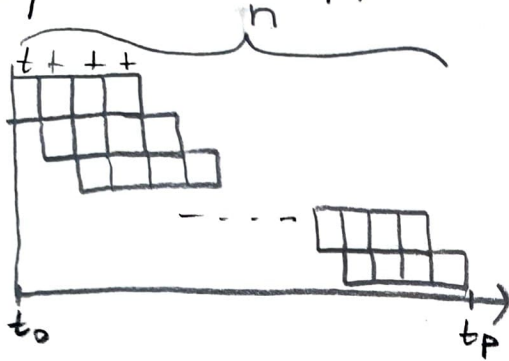


Q3.3) When we pipeline the stages, time diagram looks like:



Then the pipelined execution time

$$\text{becomes } T_p = t_p - t_0 = 4t + (n-1)t$$

Then the improvement over time:

$$I \triangleq \frac{T_s}{T_p} = \frac{4tn}{4t + (n-1)t} = \frac{4n}{4 + n - 1}$$

For fixed number of steps (4),

$$\text{as } \lim_{n \rightarrow \infty} I = \lim_{n \rightarrow \infty} \frac{4n}{4 + n - 1} = 4$$

So the improvement we get is limited by 4. That is, the best case is that we can speed up the process by 4.