

Q. 3, 4

$$T_p = (len * t + (4-1) * t) \Rightarrow \text{pipelined execution time}$$

$$T_s = 4 * (len * t) \Rightarrow \text{unpipelined execution time}$$

for one step to be executed $ov = \text{overhead}$

$$(len(t + ov))$$

for remaining 3 steps $3(t + ov)$

for all steps required time is $(len+3)(t+ov)$

$$I = \frac{(len+3)(t+ov)}{4 * len * t} \quad \begin{array}{l} \text{must be smaller than 1} \\ \text{for pipeline to be faster.} \end{array}$$

$$len = 24$$

$$\frac{27t + 27ov}{96t} < 1$$

$$27ov < 69t$$

$$ov < \frac{69t}{27}$$

$$ov < \frac{23t}{9}$$

overhead must be smaller than 2.55