7-12

MC250

Transit Voice 1.0

Train Public System
- 250 MHz
- CPI = 2.4
- Instr (I_1)

MC375

Transit Voice 2.0 (Same compiler) → instr = $3 \cdot I_1$, CPI = 2.4,

Transit Voice 1.0
- Clock Freq = 375 MHz
- CPI_3 =

Transit Voice 2.0
- $I_4 = 3I$
- $Freq_4$ = 375 MHz
- improve code → instr ↓, CPI ↓

7

$$\text{Time} = \frac{\text{Instr} \times CPI}{\text{Clock Freq}}$$

For old system, 1.0 compiler → $T_{old} = \dfrac{I_1 \times 2.4}{250 \times 10^6}$

For new sys, 2.0 → $T_{new} = \dfrac{3 I_1 \times 2.4}{375 \times 10^6}$

$$\text{Speed Ratio} = \frac{T_{old}}{T_{new}} = \frac{\cancel{I_1} \times \cancel{2.4}}{250 \times \cancel{10^6}} \times \frac{375 \times \cancel{10^6}}{3 \cancel{I_1} \times \cancel{2.4}} = \frac{\overset{125}{\cancel{375}}}{\underset{2}{\cancel{250}} \times \cancel{3}} = \frac{1}{2}$$

$$= \frac{1}{2} = 0.5$$

(9)

For MC375, Transit Voice 2.0 → new CPI = 2.1

old (2.0, MC375) vs new (1.0, MC250)

→ For old, $T_{old} = \frac{I \times 2.4}{250 \times 10^6}$

→ For new, $T_{new} = \frac{3I \times 2.1}{375 \times 10^6}$

→ Ratio $= \frac{T_{old}}{T_{new}} = \frac{\cancel{I} \times 2.\cancel{4}^{8}}{250 \times \cancel{10^6}} \times \frac{375 \times \cancel{10^6}}{3\cancel{I} \times \cancel{2.1}_{7}} = \frac{8 \times 375^{\times 4}}{250 \times 3 \times 7} = \frac{\cancel{8}^{4} \times \cancel{1500}^{\cancel{3}^{1}}}{\cancel{1000}_{\cancel{2}_{1}} \times \cancel{3}_{1} \times 7}$

$= \frac{4}{7} = 0.571$

≈ 0.57

11

→ (A) For 2·0, MC 375 → CPI = 1·5
→ no of instr = x

→ (B) For 1·0, MC 250 → no of instr = y

→ For Performance to be the same for (A), (B);
how much % should $x \to y$ be decreased?

→ For 2-0, MC375 → then CPI = 1-5

$$\text{So, } T_{2\text{-}0} = \frac{x \times 1\text{-}5}{375}$$

→ For 1-0, MC 250 → $T_{1\text{-}0} = \frac{y \times 2\text{-}4}{250}$

→ For Both Performance equal → $T_{1\cdot0} = T_{2\text{-}0}$

$$\frac{y \times 2\text{-}4}{250} = \frac{x \times 1\cdot5}{375}$$

$$x = y \times \frac{\cancel{2\text{-}4}^{8}}{\cancel{250}_{50}} \times \frac{\cancel{\cancel{375}}^{\cancel{75}\ 15}}{\cancel{1\cdot5}_{\cancel{5}\ 1}}$$

$$= y \times \frac{8 \times \cancel{15}^{3}}{\cancel{50}_{10}}$$

$x = (2\cdot4)\,y \quad \to y =$

→ Reduction $= \frac{3y - 2\cdot4\,y}{3y} \times 100 = \frac{\cancel{0\cdot6}^{0\cdot2}\cancel{y}}{\cancel{3}\,\cancel{y}} \times 100 = 20\,\%$

So, 20% reduction

$\boxed{= (0\cdot2)}$