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SCT 212-0075/2020
Lab 1.

COMPUTER TECHNOLOGY 4.2

1. Which computer is faster.

Execution time = $\dfrac{\text{Instruction count} \times CPI}{\text{Clock Rate}}$

I → Instructions by unoptimized.

Unoptimized → 5% higher clock rate, ∴ 1·05C

    Optimized → Clock rate is C

Load/Store → Unoptimized is 30% ∴ 0·3I

          Optimized ($2/3$) → $\frac{2}{3} \times 0\cdot 3I = 0\cdot 2I$

    ∴ 0·7I

Total Instructions → Unoptimized = I

        Optimized = 0·7I + 0·2I = 0·9I

Execution time → Unoptimized = $\dfrac{I \times 1}{1\cdot 05C} = \dfrac{I}{1\cdot 05C}$

        Optimized = $\dfrac{0\cdot 9I \times 1}{C} = \dfrac{0\cdot 9I}{C}$

Speedup = $\dfrac{\text{Unoptimized time}}{\text{Optimized time}} = \dfrac{I}{1\cdot 05C} \times \dfrac{C}{0\cdot 9I}$

      = $\dfrac{1}{0\cdot 945}$

      = 1·058

Optimized version is faster than unoptimized version by 5·8%

② (1) Percentage of loads to be eliminated.

Clock period increases by 5%

$$\text{Execution time} = \underset{\text{count}}{\text{Instruction}} \times CPI \times \text{Clock cycle.}$$

Load = 22.8%.

$\therefore (1-x) \times 22.8\% \times \text{time} = 5\% \times \text{time}$

$$x = \frac{5\%}{22.8\%}$$

$$= 21.9\%$$

② Where replacement isn't possible.

LOAD R1, O(R2)

ADD R3, R1, R4