Arch Solutions

تمرین تئوری سری اول

سوال اول الف)

$$\text{MIPS} = \frac{Instruction\ count}{Execution\ time \times 10^6}$$

$$\text{Execution time} = \frac{Instruction\ count \times CPI}{Clock\ rate}$$

$$\text{MIPS} = \frac{Clock\ rate}{CPI \times 10^6}$$

$\text{MIPS}_1 = \frac{3GHz}{1.5 \times 10^6} = 2000$

$\text{MIPS}_2 = \frac{2.5GHz}{1 \times 10^6} = 2500$ ⟹ Best performance

$\text{MIPS}_3 = \frac{4GHz}{2.2 \times 10^6} = 1818$

سوال اول ب)

$$\text{Instruction count} = \text{MIPS} \times \text{Execution time} \times 10^6$$
$$\text{Cycles} = \textit{Instruction count} \times \textit{CPI}$$

$\text{Instruction count}_1 = 2000 \times 10 \times 10^6 = 2 \times 10^9$
$\text{Cycles}_1 = 2 \times 10^9 \times 1.5 = 3 \times 10^9$

$\text{Instruction count}_2 = 2500 \times 10 \times 10^6 = 2.5 \times 10^9$
$\text{Cycles}_2 = 2.5 \times 10^9 \times 1 = 2.5 \times 10^9$

$\text{Instruction count}_3 = 1818 \times 10 \times 10^6 = 1.818 \times 10^9$
$\text{Cycles}_3 = 1.818 \times 10^9 \times 2.2 = 4 \times 10^9$

سوال اول ج)

$$\text{Clock rate} = \frac{Instruction\ count \times CPI}{Execution\ time}$$

$$\text{New Clock rate} = \frac{1 \times 1.2}{0.7} = 1.71 \times \text{Old Clock rate}$$

$\text{New Clock rate}_1 = 1.71 \times 3\ \text{GHz} = 5.14\ \text{GHz}$

$\text{New Clock rate}_2 = 1.71 \times 2.5\ \text{GHz} = 4.29\ \text{GHz}$

$\text{New Clock rate}_3 = 1.71 \times 4\ \text{GHz} = 6.86\ \text{GHz}$

سوال دوم

$$\text{MIPS} = \frac{Clock\ rate}{CPI \times 10^6}$$

$$\text{New MIPS} = \frac{1.8 \times 1}{1.35} = 1.33 \times \text{Old MIPS} \Rightarrow 33\%\ \text{Boost in performance}$$

$$\text{MIPS} = \frac{1.56GHz}{2 \times 10^6} = 780$$

New MIPS = $780 \times 1.33 = 1040$