CSE 331 - Computer Organization

Hw-1

1.

Question 1)

CPU time = Instructions × CPI × clock cycle time

Assume that 1 cycle time is t, Then,

CPU Time for R-Type = $50 \times 10^{6} \times 2 \times t = 100 \times 10^{6} t$

CPU Time for I-Type = $30 \times 10^{6} \times 4 \times t = 120 \times 10^{6} t$

CPU Time for J-Type = $20 \times 10^{6} \times 3 \times t = 60 \times 10^{6} t$

CPU Time Total = $(100+120+60) \times 10^{6} t = 280 \times 10^{6} t$

Since I-Type instruction is the common case with the largest CPU time, I choose improving I-type instruction to make the largest improvement in the program.

50% improvement in I-type instructions:

New CPU Time for I-type = $120 \times 10^{6} t / 1,5 = 80 \times 10^{6} t$

Will make the total CPU time:

New CPU Time Total = $(100+80+60) \times 10^{6} t = 240 \times 10^{6} t$

Speedup = Execution Time Old / Execution Time New

$= (280 \times 10^{6} t) / (240 \times 10^{6} t)$

$= 1,17$

Improving I-type instructions with 50% will lead program to be approximately 1,17 time faster.

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