ZHEJIANG UNIVERSITY COLLEGE OF INFORMATION SCIENCE AND ELECTRONICS ENGINEERING

HOMEWORK #1

Computer Organization and Design

Name: Student ID:
Major: Electronic Science and Technology

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Problem 1.

1.14 Another pitfall cited in Section 1.11 is expecting to improve the overall performance of a computer by improving only one aspect of the computer. Consider a computer running a program that requires 250s, with 70s spent executing FP instructions, 85s executing L/S instructions, and 40s spent executing branch instructions.

1.14.1 [5] <§1.11> By how much is the total time reduced if the time for FP operations is reduced by 20%?

1.14.2 [5] <§1.11> By how much is the time for INT operations reduced if the total time is reduced by 20%?

1.14.3 [5] <§1.11> Can the total time be reduced by 20% by reducing only the time for branch instructions?

Answer :

1.14.1 The FP operations time is reduced by $70s \times 20\% = 14s$. Therefore, the total time is reduced by 14s, resulting in a new total time of $250s - 14s = 236s$. the reduction in total time is (250 - 236)/250 = 5.6%.

1.14.2 The time for INT is 250-70-85-40=55s. The total time is reduced by 20%, so the new total time is $250s \times 0.8 = 200s$. The time for INT is reduced by $250s - 200s = 50s$. The time for INT is reduced by 50s, resulting in a new time for INT of $55s - 50s = 5s$. The reduction in time for INT is (55 - 5)/55 = 90.9%.

1.14.3 No. The time for branch instructions is only 40s. Even if the time for branch instructions is completely eliminated, the total time can only be reduced by 40s, which is not enough to achieve a 20% reduction (50s).