Computer Architecture   Homework 1

This homework attempts to help you start learning Computer Architecture. It also provides you with a few sources of information that might be useful in your future research work.

Please state clearly any assumptions you make in solving the following problems.

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1   Benchmarks

We will attempt in this problem to train you to find, understand, and describe benchmarks used to compare machines.

1. Please visit the top 500 supercomputers page (`http://www.top500.org`) and write a short report (no more than two pages) comparing 5 machines from any point of view you desire. (One of the top 500 machines is physically close to you! Did you see it?)   (4 points)

2. Next, go to the SPEC benchmark suite (`http://www.spec.org`) and the the TPC benchmark suite (`http://www.tpc.org`) pages and write a short report (no more than two pages) comparing the various benchmarks, at least one from each suite, from any point of view you desire.   (4 points)

3. In your view, why is the ranking of the top 500 not using neither SPEC nor TPC?   (2 points)

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2   Classical papers versus current reality

Let us review one of the ideas presented in the classical paper of Gordon Moore "Cramming more components onto integrated circuits". In 1965, he posed the question "Will it be possible to remove the heat generated by tens of thousands of components in a single silicon chip?"

Read his answer and discuss its validity in today's chips.   (4 points)

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3   Multiple choices

Choose the most appropriate answer **and give your reasons.**

1. Which speedup could be achieved according to Amdahl's law if an "infinite number" of processors is available but 4% of a program is sequential and the remaining part is ideally parallel?   (3 points)

    (a) Infinite speedup

    (b) 4

    (c) 25

    (d) 50

    (e) None of the answers above is correct.

    Reasons:

2. Given a program in a high-level language and an ISA, the number of machine instructions that this program will translate into depends on: (3 points)

    (a) The ISA and the compiler translating the program.

    (b) How the ISA is implemented.

(c) On both the above.

(d) On none of the first two choices (2a and 2b).

(e) It does not depend on the ISA. It depends only on the compiler.

Reasons: