Exam, Introduction to Electronic System Design (DAT091, DAT092, DAT093)

Tuesday Oct 27, 2015

Time and place: Tuesday Oct 27, 8:30, V building

Examiner: Lars Svensson

Department: Computer Science and Engineering

Inquiries: Lars Svensson (ext. 1704); will visit the room at 9:30 and at 11:00

Solutions: To be posted on Oct 28, in PingPong

Results: To be posted on or before Nov 13, in LADOK

Grading review: Room and time to be posted in PingPong

Grade limits:

3: 24–39 points; 4: 40–49 points, 5: 50– points

Extra grade points earned during the lab course (the 2015 installment) will be added to the exam result before computing the final grade.

Allowable references and utilities: English dictionary; no other books or papers.

General: Submit your solutions, ***in English***, on the blank paper sheets provided. Write legibly; feel free to use figures to get your point across.

Please do not combine solutions to several problems on the same sheet. Please order your sheets in sequence with the problems solved. Please write on only one side of each sheet.

In some problems, it may be necessary to make assumptions. When you do, state your assumptions explicitly and motivate them. Reasoning and descriptions can give partial credit even if the end result is incorrect.

The maximum points for each problem is given in parenthesis after the problem text.

Be sure to write your identification code on each sheet!

Good luck!

Problems

1. (a) Give at least two reasons why the packaging of electronic components is of importance for system development. (2p)
   (b) What determines the frequency of time-of-flight ringing on a PCB? How could you make use of that information when debugging your PCB? (2p)
   (c) Compare and contrast surface mounting and through-hole mounting of components on PCBs. When would each method be preferrable? (4p)

2. The phrase "lies, damned lies, and benchmarks" indicates how difficult it can be to arrive at commonly-acceptable methods of performance comparison.
   (a) Surely, a first step must be to agree on what should be measured and compared. Discuss how to compare the logic design of the constituent configurable logic blocks of two different FPGA designs. (4p)
   (b) Selection of a microprocessor for an embedded system is often based at least in part on benchmark results. Discuss some ways in which such benchmarks can mislead the designer! How can the designer avoid these problems? (4p)

3. (a) How may device variability in present and future semiconductor processes contribute to higher power dissipation for digital circuits? Two mechanisms for full marks. (4p)
   (b) Briefly describe two ways to combat the detrimental effects of device variability. (4p)

4. (a) The choice of technology platform is usually determined by a combination of several design requirements. Briefly discuss requirements that would cause you to consider an FPGA platform and an ASIC platform, respectively, and compare and contrast the two cases. (6p)
   (b) The ASIC/FPGA consideration need not be a strict either/or choice. Briefly discuss how the two technologies can be used to complement eachother in the same project. (2p)

5. (a) How can the selection of implementation technology affect the power dissipation of an electronic (sub)system? Compare at least three alternative technologies. (4p)
   (b) Describe the concept of clock gating. How can it improve power dissipation in a digital system? Are there any pitfalls to consider when applying it? (4p)

6. The reading material of the course has included the classic paper that introduced the "waterfall" design process (or at least the name which is commonly used for it...), and also some newer publications which outline current thinking. Describe, in your own words, the design-process progress since the 1970s until present; what has changed, what remains the same, and what is driving the evolution? Feel free to include examples from industry guest lectures, if appropriate. (8p)

THE END