

## Final Exam

Cleveland State University  
Electrical and Computer Engineering  
**Distributed:** Dec 3, 2009

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**This is an open-book, open-notes, closed-neighbor, mostly-closed-internet exam.**

**Due: 6pm on Tuesday, December 8, 2009**

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There are 150 points on the exam. Provide answers to these questions in a separate document. Please typeset your answers using a word-processing program. Do not turn in hand-written answers. Your responses should be in 12-point text, single-spaced.

All the questions on this exam are to be answered with short, descriptive responses. Please limit your answers to word limit presented along with each question. There are a total of 10 questions in this exam. Answer all of them. Note that many of these questions may not have a single “correct” answer. I am looking for how well you can defend any position you take. Be careful when you write your responses. Please do not ramble. Write declarative, to-the-point, answers. Remember, I am looking for quality in your responses, not quantity.

Try **not** to use the Internet to answer these questions. I am looking for **your** answers, not someone else’s. And remember, if you do take ideas from somewhere on the Internet, include a proper reference, and *DO NOT* copy verbatim. Just keep in mind that if you could google something, so can I. :-)

Please **do not** collaborate with anyone else from the class when answering the questions. Any collaboration will be considered academic misconduct.

Please **begin your answer on a new page**, and submit them in the correct order.

Your answers are due by **6pm on Monday, Dec 8**. Late submissions **will not be graded, and you will receive no credit for the final exam**. You can send your answers in by email (both [n.sridhar1@csuohio.edu](mailto:n.sridhar1@csuohio.edu) and [nigamanth@gmail.com](mailto:nigamanth@gmail.com)). Please send me a **PDF**, *not* a Word document.

It was a lot of fun teaching this class, and I certainly learned a lot from this semester. I hope you learned something, and I hope more that the class was fun to you as well. Please try and have fun answering these questions. Be creative in your answers.

– Nigamanth

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1. (20 points; 200 words) You are preparing to deploy a traffic monitoring system to detect why vehicles crash in construction work zones. The software you design will be deployed on a distributed system of sensors and actuators to collect traffic statistics, and to analyze such statistics to find causes for crashes or “near-crashes.” What process model will you follow to develop this system, and why?
2. (20 points; 150 words) Develop a mathematical model in which you can define a suitable measure of the *marginal utility* of an additional worker who is assigned to some task. As an example, for picking cotton the marginal utility of an additional worker should be about 1 under most conditions, and for having a baby the marginal utility of an additional worker (beyond the mother) should be 0. Being as rigorous and quantitative as possible, discuss the likely behavior of the marginal utility function for a typical software engineering project. Relate any qualitative observations you have read about software projects (perhaps even experienced) to your quantitative model.
3. (10 points; 120 words) Software’s been around for about 60 years. We’ve had a long time to figure out how to do this right. Why do you think we still have such a large number of software defects? What, in your mind, are the most important problems? What have you learned in this class about directions to look for solutions?
4. (20 points; 150 words) You work on a large dev team on a project that is critically important to the success of your company. After several months of work, the project is failing. The project manager wants to establish which members of the team have contributed positively to the project, and which ones have not. How would she go about doing that? What metrics would she use, and how would she collect them?
5. (15 points; 120 words) If Fred Brooks had written his “Silver Bullet” article today, what three technologies would show up highest on his list of candidates?
6. (15 points; 150 words) Software engineering academics said for years that a significant percentage of large software projects failed. In the run-up to Y2K, most of the world’s large companies claimed that fixing the Millennium Bug was a large project whose success was critical to their survival. One would therefore expect many large companies to have failed, but none did. Who was mistaken? Justify your answer.
7. (20 points; 200 words) Write test cases for the login page for an online Webmail service (e.g. Gmail, Yahoo mail, etc.). Include both positive and negative test cases.
8. (10 points; 100 words) Over the course of the semester, we have at different times advocated formal specifications of software, and informal scenario-based descriptions of software. How can both approaches be correct? What are the values of each of these approaches? How do they complement each other, if at all?
9. (10 points; 40 words) Here is an exercise in abstraction: How would you explain how the World Wide Web works to your grandmother?
10. (10 points; 100 words) What is the significance of **predictability** of the various steps in a software process? In other words, why do we care that a particular step is predictable?