

Student ID: _____

**CS-736 Midterm: Off By One
(Fall 2007)**

An Arpaci-Dusseau Exam

Please Read All Questions Carefully!

There are eight (8) total numbered pages

Please put your NAME ONLY on this page, and your STUDENT ID on this and all other pages. Why? So I can grade without knowing who you are. Particularly useful for students who think I don't like them.

Note: I like all of you, so this is not really a problem.

Name: _____

Student ID: _____

This is the grading page.

	Points	Total Possible
1		5
2		5
3		5
4		5
5		5
6		5
7		5
8		5
9		5
10		5
11		5
12		5
13		5
14		5
Total		70

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One of the most common programming errors that occurs is known as “off by one.” As defined:

off-by-one error /n./

Exceedingly common error induced in many ways, such as by starting at 0 when you should have started at 1 or vice-versa, or by writing $< N$ instead of $<= N$ or vice-versa. Also applied to giving something to the person next to the one who should have gotten it.

Unfortunately (for you), numerous “off by one” errors have recently been discovered in some of the systems you have studying (shocking! but true). In this exam, your job is simple: discuss how the off-by-one error in each question will affect the system under examination.

NOTE: Please read each question CAREFULLY, as the question will tell you exactly which ramification of the off-by-one bug to discuss.

Also, keep your answers short and to the point; there are no style points for long-winded answers (rather, quite the opposite!).

And, most of all, have fun!¹

¹OK, I am not too serious about having fun. Mostly, just try to finish the exam in less than two hours and go home and take a nap.

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13. The **IRON file system** is obviously awe-inspiring. It turns out, though, that the conclusions of the paper were off by one. Specifically, the ReiserFS “do no harm” policy was actually implemented by ext3; the ext3 “simple but reliable (but perhaps over-reactive)” policy was implemented by JFS; and the “kitchen sink” policy was implemented by ReiserFS. Describe these policies, and then tell me which you think is best and why.

14. **Exokernel** is from M.I.T. and therefore has no bugs. But, it may not be all perfect, alas. Discuss a scenario where exokernel performance will likely be *worse* than a typical general-purpose operating system.