SE 101 Introduction to Methods of Software Engineering
Quiz #1

Prof. J. Atlee
October 7, 2004
10:30 a.m.
45 min.

Student name:_____
Student ID: _____
Student Block Number: _____

This quiz is closed book, closed notes. The only allowed aid is your Math-Faculty calculator. The quiz is double-sided. There are four (4) questions, worth a total of 65 marks. Show your work to receive partial credit for incorrect answers.

1. (3 marks) Software Engineering
Explain to a non-technical person (a family member) what the discipline of software engineering is all about. Restrict your answer to 2-3 sentences.

- Engineering of software systems.
- Study of how to develop quality software, on time, and within budget.
- Study of all the activities performed to develop a software system, from initial idea to final product.
- Application of engineering principles, practices, and process to the development of software products.
- Systematic /quantitative processes for developing and maintaining software systems.

Mentioning one of the above (2 marks)
Nontechnical answer (1 mark)

2. (30 marks) Error Propagation
Keith Beavers, a UW student, went to the Olympics this year as a member of the Canadian Swim Team. He holds the Canadian record in the 200m backstroke; his record time is 1:59.15 (1 minute and 59 $^{15}/_{100}$ seconds).

a) What is the implied uncertainty in this record time? Give both the absolute and the relative error.
0.005 s (absolute) (2 marks)
0.004% (relative)

b) Rewrite this record time so that the unit of measure is *seconds* (s), and express your answer in *engineering notation.* Use the appropriate number of significant digits, and include the *absolute uncertainty.*
$(119.15 \pm 0.005) \times 10^0$ s engineering notation (2 marks)
value (1 mark computation, 1 mark sig fig)
error (1 mark)
unit of measure (1 mark)

c) Let's assume that in his record swim, Keith swum in a straight line, and that he covered a distance of (200 ± 0.02) m. What was Keith's average speed in this race, to the appropriate number of significant digits? Express your result in *scientific notation,* and include the *absolute uncertainty*. **You must show your work to receive any credit (including the formula that you are using).**

$(d \pm \Delta d)/(t \pm \Delta t) = d/t[1 \pm (\Delta d/|d| + \Delta t/|t|)]$
$= (200 \pm 0.02)\text{ m} / (119.15 \pm 0.005)\text{ s}$
$= (200 \pm 0.01\%)\text{ m} / (119.15 \pm 0.004\%)\text{ s}$
$= (200/119.15 \pm (0.01 + 0.004)\%)\text{ m/s}$
$= (1.67855644146 \pm 0.014\%)\text{ m/s}$
$= (1.6785 \pm 0.0002)\text{ m/s}$

formula (2 marks)
showing some work plugging values into formula (2 marks)
value (2 marks for correct value, 1 mark for sig figs)
error (2 marks for correct value, 1 mark for sig figs)
scientific notation (2 marks)

d) Using *linear approximation*, approximate the worst-case uncertainty in your calculation of average speed. **You must show your work to receive any credit (including the formula that you are using).**

$(|\partial v/\partial d| \bullet \Delta d + |\partial v/\partial t| \bullet \Delta t)\text{ m/s}$
$= (|1/t| \bullet \Delta d + |-d/t^2| \bullet \Delta t)\text{ m/s}$
$= (1/119.15)(0.02) + (200/119.15^2)(0.005)\text{ m/s}$
$= 0.000167855 + 0.00007\text{ m/s}$
$= 0.0002\text{ m/s}$

formula (2 marks)
derivative (4 marks)
showing some work plugging values into formula (2 marks)
correct answer (2 marks)

3. (8 marks) Report Formatting

You are writing a report about the Midnight Sun VII, a solar-powered racecar built and operated by UW students. The Midnight Sun VII recently completed a 40-day tour of North America, breaking the world record for the longest journey by a solar-powered vehicle. Your report contains information about the tour: the cities visited, the dates and times that the car was driven, the tests performed before each drive to determine whether the car was fit to drive, and so on. For each of the following types of information, state whether it would be best to represent the information as a figure, as a table, or as a displayed list (choose only one), and *explain why* it is best*:*

a) The car's special features, such as its aerodynamic shape, the number and locations of its solar panels, battery pack, and so on

Figure – to better show what each of the features looks like and to show the features' locations on the car

b) The route taken by the car, driving west from Waterloo through major Canadian cities (e.g., Winnipeg, Regina, Calgary, Vancouver), driving down the Pacific coat to Los Angeles, driving east across the southern United States, up the east cost to St. John's, and back to Waterloo

Figure – to show the details of the route, and to show how much ground was covered each day

c) The series of 15 tests that the team performs on the car before every drive

List – assuming that the tests are performed in a series, a numbered list emphasizes the sequence of the tests, and lists each test on a separate line. A textual description would make it harder for a reader to find the tests in the report without reading the text. An intext list would be clumsy, as it would have 15 entries. A table would be overkill, as it would have only one column of data.

d) The travel log listing, for each segment of the tour, the date, start time and end time of the segment; the name of the driver; the distance covered; and the level of the battery pack at the start and end of the segment

Table – The travel log consists of multiple types of data for each segment, which is perfect for a multi-column table. Annotating a figure of the route with each segment's data would result in a cluttered figure. A multi-column list with heads, where heads provide units of measure is starting to look like a table; and the list would be too long to insert in the middle of the text.

4. (24 marks) Grammar
Below are two paragraphs that contain multiple grammatical or style errors. Identify and correct 12 errors by crossing out incorrect text and inserting corrections. You earn 2 marks for each error that you correct, for a maximum of 24 marks. You lose 1 mark for each error-free text that you identify as being incorrect. Multiple modifications to fix one error (e.g., replacing a comma with a period, and capitalizing the word that follows the new period) count as one correction.

The class may want to reconsider its class ~~-~~ name~~:~~, "SE(men)". Although the name may have seemed funny at the time of the vote, several students have since expressed reservations. ~~E.g.,~~ For example, some students think that the name is crass and unprofessional. EngSoc's Web site discusses class names and ~~said~~ says "we try to steer clear of … crude and obtuse [names] nowadays." ~~This means that~~ Thus, the name "SE(men)" may not conform to EngSoc's current guidelines on appropriate class names. ~~Another concern raised by students is~~ Students are also concerned that the name is somewhat sexist~~,~~: It implies that only men are enrolled in the Software Engineering program.

There are several aspects to a typical class name: it tends to be a twist on the class's program name, or some other identifying feature of the program~~,~~; it is often a double entendre~~,~~ (i.e., has multiple meanings, one of which is sexually suggestive)~~,~~; and it is a reflect~~s~~ion of the class's personality. For example, the other SE classes' class names are~~:~~ "SE-Xperts" (Class of 2006), "Softcorps" (Class of 2007), and "SE(x,y)" (Class of 2008). These names demonstrate that a good class name needn't be puritanical. In summary, I hope that the class will reconsider its name, because it would be nice if the entire class were proud, rather than embarrassed, of ~~their~~ its name.

Bonus question (1 mark): Suggest a new class name. (new, SE related – 1 mark)