SE 101 Introduction to Methods of Software Engineering
Quiz #3

Prof. J. Atlee   **Student name:**_____
December 2, 2004   **Student ID:** _____
10:30 a.m.   **Student Block Number:** _____
45 min.

This quiz is closed book, closed notes. No aids are allowed. The quiz is double-sided. There are 5 questions, worth a total of 50 marks. Show your work to receive partial credit for incorrect answers.

1. **(12 marks) Professional Engineering**
    a. List three things that you, as an SE student, have to do to become a licensed Professional Software Engineer in Ontario. (In your answer, you may assume that the Software Engineering program is accredited.)

    (6 marks)
    1. Graduate from the (accredited) SE program
    2. Acquire four-years of relevant work experience
    3. Pass the professional practice exam

    b. Name two types of software systems (e.g., computer games) whose design and development might fall under the Professional Engineers Act. Explain why.

    (4 marks)
    o Medical devices, medical monitors
    o Software that controls transportation systems (trains, planes, cars)
    o Software that controls plants (chemical reactions, electrical transmissions)
    o Software that controls moving structures (draw bridges)
    o Defense systems (border or airspace monitors, weapons systems)

    c. Would you necessarily lose your license if you were a Professional Software Engineer and you developed a software system that caused harm to someone? Defend your answer in 1-2 sentences.

    (2 marks)
    No. Only if you were found to have been negligent (i.e., failed to use standard practices) would you be at risk of losing your license.

2. (16 marks) Grammar

Below are three paragraphs that contain multiple errors with respect to word choice. Identify and correct 8 errors by crossing out incorrect text and inserting corrections. You earn 2 marks for each error that you correct, for a maximum of 16 marks. You lose 1 mark for each error-free passage 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.

There is a recent New York Times article in which the author (John) describes his experience of buying his friend Kenny's used iPod,[1] which ~~that~~ had not been wiped clean. When John went to load his own songs onto the device, he saw that there were no ~~less~~ fewer than 3000 songs already loaded. He scrolled ~~quick~~ quickly through the disk's contents and saw that it ~~was comprised of~~ included lots of songs ~~which~~ that he did not own and many artists of ~~which~~ whom he had never heard. He decided that he would listen to Kenny's songs, ~~such~~ so that he might discover songs that he liked and would want to buy.

John was surprised, however, by how the songs affected his impressions of Kenny. He considered ~~everyone~~ every one of the songs as a data point that provided unique insight into his friend. He was intrigued by the possibilities of using the songs to construct a new, more intimate understanding of his friend and of comparing the songs to Kenny's public persona.

The article also includes a number of quotes from experts ~~that~~ who say that the musical information stored on one's iPod, or similar music disk, is not so different ~~than~~ from the personal information stored on one's computer disk. These experts muse that marketers could ~~deduce~~ infer one's "emotional identity" from such information, in the same way that marketers infer preferences from one's video rentals and book purchases. One expert says that he drills holes in any hard disk that he is junking, so that no one ~~noone~~ can retrieve any identifying information from the discarded disk. The experts assure John that the contents of his music disk are personal; and they advise him to be ~~wisely~~ wise in his choices about with ~~who~~ whom he shares his music disk.

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[1] An iPod is a music player that is a competitor to MP3 players.

3. (12 marks) Intellectual Property

Brainbot is a robot that was developed to assist in high-precision brain surgery. The surgeon inputs medical images (e.g., images from CAT scans and MR scans) of the patient's brain and the target location within the images. The surgeon also fits the robot's head with the appropriate surgical instrument, which the surgeon will use once the robot has positioned the instrument. Brainbot has a camera that it uses to map the local terrain of the patient's brain. Brainbot's software matches the robot's camera images with the scanned images to guide its path through the patient's brain to the target location. The robot has a specialized microprocessor that is designed to optimize the accuracy and speed with which the software compares images and determines the robot's location. The robot head needs only a 1-mm path through the brain and has sub-millimetre accuracy in positioning instruments at the target location, whereas the accuracy (uncertainty) of a surgeon's hand is several millimetres. Brainbot works with the standard image format produced by most modern CAT scanners and MR scanners. The robot's head can be fitted with standard instruments designed for neurosurgery.

a) Name four different types of intellectual property, as described in the IPE text.
b) For each of the types of IP that you named in part a), cite an example of that type of IP from the above product description.
c) For each of the types of IP that you named in part a), state how long the property can be legally protected from unfair use by others. (For types of protection that can be renewed, like trademarks, state the length of protection of a single term or a single registration.)

Type of Intellectual Property	Example from Brainbot	Length of IP Protection
Patent	o Entire robot o Software that compares images o Image standards o Surgical instruments	20 years (from date of filing application)
Copyright	o Software source code o Software object code	Life of creator plus 50 years
Trademark	Name of Brainbot	15 years (per term)
Integrated circuit topography	Specialized microprocessor	10 (from date of filing application)

4. (2 marks) Safety

For the Brainbot product described in question 3, give an example of a possible hazard that could occur when using Brainbot.

- Robot positions instruments incorrectly
- Robot damages brain on path to target location
- Robot drops instrument on the way to the target location

5. (8 marks) Software Quality Attributes

For the Brainbot product described in question 3, give two examples of quality attributes (besides "safe") that users or safety regulators would want the software to exhibit. For each quality attribute that you list, provide an example of a measurable requirement (i.e., a concrete expression of the attribute that could be used to determine objectively whether the system exhibits that attribute).

(2 marks for reasonable quality attribute, 2 marks for measurable requirement)

- Accurate – robot positions instruments to within 0.5 millimetre
- Precise – robot's path to target location is no more than 1 millimetre
- Interoperational – works with standard image formats and standard surgical instruments
- Fast – robot moves at least 1 cm / 1 minute

- Easy to use – 90% of surgeons can set up machine in less than 10 minutes
- Available – system is operational 99.999% of the time

Bonus (3 marks) Grammar

Circle all of the incorrect uses of the words "that", "which", and "this" (and related words). Do not correct the sentences.

(+1 mark for each identified error, -1 mark for each non-error circled)

Many use the words "which" and "that" incorrectly. This caused many to lose lots of marks on their design reports. The word "that" is used to identify a particular object (or set of objects) from a (larger) set of objects. The word "which" is used to add nonidentifying and nonessential information about a particular object (or set of objects); this information is expressed as a separate clause separated by commas. "Who" is a word which is used primarily when referring to people. Another error that many make is to use the word "this" (or "some", "many", "these", etc.), with no accompanying noun, as the subject or object of a sentence. Now that this is clear, you should make no errors using "which", that", or "this" which will result in your losing marks on your work-term reports.