# Homework 1

**To:** All students in CSCI 5802 (Spring 2018)
**CC:** Teaching Assistant
**From:** Instructor
**Date:** 1/24/2018
**Due:** 2/5/2018, Monday, 11:55 PM, on Moodle.
**Re:** Homework Assignment 1 – Fundamentals, Functional Testing

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*There are 8 problems worth a total of 100 points. You may discuss these problems in your teams and turn in a single submission for the team, in PDF format, on Moodle.*

**1. 12 Points**

(a) Exercise 1.1 in the textbook. Provide at least one positive consequence and one negative consequence, with a brief argument supporting your conclusions.

(b) Exercise 1.5 in the textbook. (Imagine that there are two competing project proposals before you to improve the system, each would cost the same, but one would double availability while the other would double MTBF. You have to choose one of the two and justify it). *Hints: First compute availability and MTBF with the given numbers. Determine how many users will be affected by unavailability and how many due to failure under different scenarios (e.g., peak-hours, lean-hours) and use that to argue which parameter you would choose to double.*

**2. 12 Points**

(a) Exercise 2.3 in textbook. State what quantitative parameters would be needed to make it a verifiable specification and briefly describe how you would go about determining values for those parameters.

(b) Exercise 2.4 in textbook. For each option, consider (i) whether there is optimistic or pessimistic inaccuracy, and (ii) whether there is any simplification of the original property (i.e. serializability) which is to be ensured.

**3. 12 Points**

(a) Exercise 3.1 in textbook. Briefly explain your rationale.

(b) Exercise 3.3 in textbook.

**4. 12 Points**

(a) Exercise 4.2 in textbook. Explain clearly why the two measures are different for your chosen scenario. *Hint: You may use specific numbers for the quantities involved if that helps.*

(b) Exercise 4.6 in textbook. Briefly explain your reasoning behind the relative importance of the three attributes for the application domain that you choose.

**5. 12 Points**

A company is developing an online social networking service. As they prepare for release, the company plans to conduct beta testing in order to measure the reliability of the service. In beta testing, the online social networking service will be open to a limited number of users who will receive invitations from the company. The selected users are long-time, enthusiastic, or paid users of other products from this company. Furthermore, in order to limit language ambiguities, the company decided to open this product only to American users.

How might these testing results (e.g., user feedback) still be misleading with respect to the reliability of the software product? What might the company do to mitigate potential issues from this inaccurate estimation?

**6. 12 Points**

The following properties emerge during the development of the software for an Automatic Teller Machine (ATM). For each of the following, identify whether it is a correctness, robustness, or safety property. Briefly justify your classification.

a) If the network connection is interrupted, the session shall be immediately terminated with an appropriate error message. No funds shall be dispensed, and no changes shall be made to a user's account.
b) The account identifier of the account loaded by the utility shall exactly match the account identifier of the input debit card.
c) The amount requested by the user shall only be debited from their account following confirmation of the successful withdrawal of funds.
d) If no physical money remains in the unit following a completed transaction, the utility shall cease standard operation and display an error message until a manual override is initiated.

**7. 16 Points**

(a) Exercise 9.1 in textbook. Briefly justify why or why not subsumption relation holds for each pair of criteria.
(b) Exercise 9.3 in textbook. Explain with an example.

**8. 12 Points**

(a) Exercise 10.2 in textbook. *For the purposes of this exercise you may assume that there are no errors due to approximations involved in floating point operations.*
(b) Exercise 10.3 in textbook. Briefly describe how the units you identify partition the features and functions listed for the desk calculator.