THE UNIVERSITY OF THE WEST INDIES

Semester I ☐ Semester II ☐ Supplemental/Summer School ☒

Examinations of December ☐/ April/May ☐ / July ☒ 2015

Originating Campus: Cave Hill ☐ Mona ☒ St. Augustine ☐ Open ☐

Mode: On Campus ☒ By Distance ☐

Course Code and Title: **COMP2140 SOFTWARE ENGINEERING**

Date: Tuesday, July 21, 2015 Time: 9-11 a.m.

Duration: 2 Hours. Paper No: 1

Materials required:

Answer booklet: Normal ☒ Special ☐ Not required ☐

Calculator: Programmable ☐ Non Programmable ☐
(where applicable)

Multiple Choice answer sheets: numerical ☐ alphabetical ☐ 1-20 ☐ 1-100 ☐

Auxiliary/Other material(s) – Please specify:

Candidates are permitted to bring the following items to their desks:

Instructions to Candidates: This paper has 4 pages, 4 questions

DO QUESTION 1 AND ANY TWO OTHER QUESTIONS

Candidates are reminded that the examiners shall take into account the proper use of the English Language in determining the mark for each response.

Question 1 [28 marks]

Please refer to Appendix A in answering this question.

a) From the overview given:
   i. Identify one functional requirement. [1]
   ii. Identify one non-functional requirement that is verifiable by the way it is stated. [1]
   iii. Identify one non-functional requirement that is not verifiable by the way it is stated and restate the requirement to address this deficiency. [2]
   iv. Identify a domain requirement and say whether or not it will lead to a functional requirement, or non-functional requirement. [2]

b) Draw a Use Case diagram for the application. Marks will be awarded for:
   i. Identification of system actors. [1]
   ii. Identification of use cases and proper associations with actors. [1]
   iii. Conformance to UML Use Case syntax. [1]
   iv. Identification of an "includes" relationship between two use cases and an inheritance relationship between two actors. [1]

c) Using class names only (no attributes or operations), sketch a UML Class diagram representing the major entities in the problem. Your diagram should show inheritance and aggregation relationships where these exist. Also, associations must show multiplicity (cardinality) [4]

d) Refer to the sequence diagram given in Figure 1 of Appendix A.
   i. Identify the event that causes control to be transferred from the user interface object to the AccountDB object. [1]
   ii. John is a regular user of the system and is also an administrative user. Say whether or not John will need to have two different user names for the application. Be sure to mention details of the sequence diagram that support your opinion. [1]
   iii. There is one non-functional requirement that is not satisfied by this design. Mention where this shortcoming is observed and redraw the relevant portion of the diagram to correct the error. [2]

e) Orders are to be sorted by a unique serial number (an order number) when listed on management reports. Assuming that an order number is implemented as a string:
   i. Write Java code for the class header of the Order class to indicate that orders are comparable. [1]
   ii. Write Java code for the method that is to be invoked automatically when two orders are compared. [3]

f) Consider the case where the Order processing application is to be developed by your firm but you do not have enough resources to conduct thorough testing. Consequently you decide to confine testing to unit testing only.
   i. State briefly what unit testing, is and what stage of development this type of testing occurs. [2]
   ii. Describe one other type of testing that your decision will ignore and suggest one problem that can arise because of your decision. [1]
   iii. Identify one principle of the ACM/IEEE Code of Ethics that will be violated by your decision, giving a reason to support your response. [1]

***** End of Question 1 (Well Done) *****

Question 2 [7 marks]

a) Describe two features that distinguish agile software processes from plan driven software processes. [2]

b) Recall any one of the architectural patterns that were discussed in this course and:

i. Draw a diagram that depicts how the component of the architecture are organized. [1]

ii. Comment briefly on how this architecture impacts on efficiency and maintainability. Your comments must describe how the architecture affects each quality factor. [4]

Question 3 [7 marks]

a) Distinguish between validation and verification in the context of software development. [1]

b) Give one reason for, and one reason against, the use of prototyping for software development. [2]

c) Distinguish between coupling and cohesion and explain how each relates to software maintainability. [2]

d) Project Management consists of several interacting process groups. State two of these process groups and say briefly what is involved in each. [2]

Question 4 [7 marks]

a) Explain briefly what is meant by system re-engineering and say why this might become necessary in the life of software. [2]

b) With reference to software configuration explain very briefly what a merge is and say why this action becomes necessary. [2]

c) Some software developers test software by issuing it to users who report errors which are then fixed by the developer.

i. State the name given to this type of software testing and suggest one type of software for which its use can be considered appropriate with a reason for your opinion?

ii. Identify one ethical principle that is violated if this practice is carried out in the development of software that controls an automated insulin pump.

***** END OF PAPER *****

APPENDIX A: SUPPORTING MATERIAL

Overview of a Problem

A software application is to be built to manage order processing operations for a store. The users of the application shall include unregistered users, registers users, sales clerks and a manager. The application shall be web based and shall allow an unregistered user to browse the items in stock and to register. A registered user can (in addition to browsing) create an order. An order can have one or more items where an n item can either be a composite item, or a simple item. A composite item is a collection of simple items. A sales clerk prints and prepares the items to be picked up by the customer. The customer must visit the store to make payments and receive the ordered items. An arrangement can be made to make up to three payments for the order but an initial payment must be made when picking up the items. The manager updates the stock and generates management reports on a daily basis.

All the web pages are required to bear the store's logo in the upper right hand corner. Needless to say, the system must be fast and reliable. In accordance with industry standards, all prices must be displayed before tax. Finally, the application should conform to Security Standards (SEC-41A) in that three invalid attempts to logon should result in the user being locked until reset by the manager.

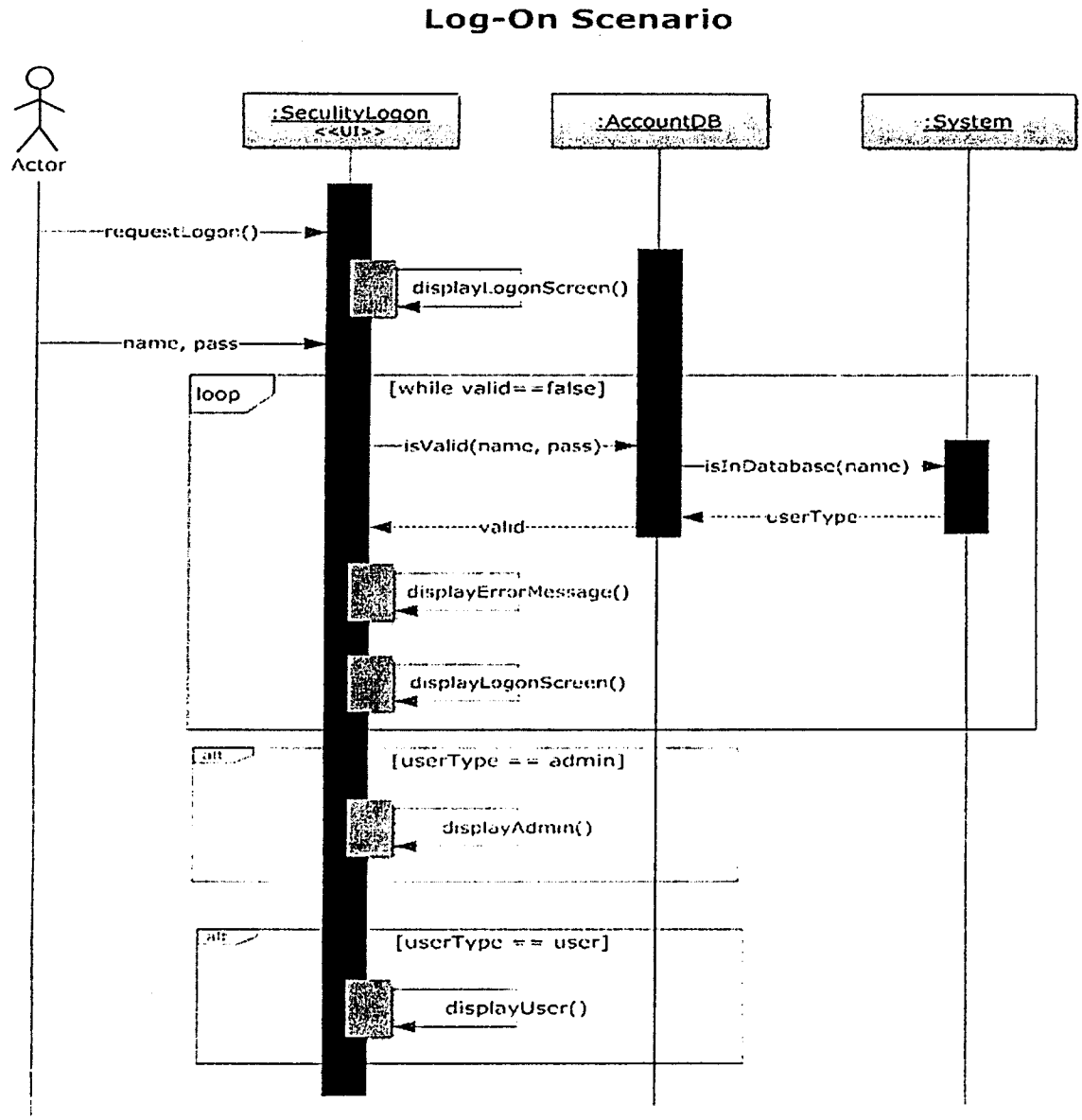

Figure 1: Sequence Diagram for the Logon Use Case