



THE UNIVERSITY OF THE WEST INDIES

Semester I ☐ Semester II ☐ Supplemental/Summer School ☐

Examinations of December ☐ /April/May ☐ /July ☐ 2008

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

Mode: On Campus ☒ By Distance ☐

Course Code and Title: Introduction to Software Engineering — **CS220**

Date: **Tuesday, December 09, 2008**

Time: **1:00 PM – 3:00 PM**

Duration: **2** Hours.

Paper No:

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 **3** pages & **4** 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.

Do Question 1 and Any Other Two

Question 1 *General Question [30 marks] [Compulsory Question]*

An entrepreneur has discovered a “gold mine”. He has acquired a property of several acres of land and has calculated that if he grows bananas he will be able to make millions from that within two years. He calls it Banana GoldMine Limited (GoldMine).

With the millions earned from GoldMine he will be able to invest in a poultry farm which will share the same property as the banana farm. He decides to call his poultry farm “Island Broilers Ltd” (IBL) and he is eyeing the entire Caribbean region as his market (and is praying very hard for Caricom to move fast). Having read a story about a dairy farm on the

slopes of the Blue Mountains and having suffered from a milk shortage late last year he decided that there is room for another successful dairy venture. His will be called “First Class Milk Ltd” (FCM).

This guy has imagination (and Einstein once said that Imagination is more important than Knowledge!) He now has this great idea of forming a group of companies! Brilliant!! To GoldMine, IBL, FCM, he is now adding “Silicon”, his software development company. Silicon will develop software by following the recommended software engineering practices as taught in CS22Q and in other first rate software engineering courses. He thinks he is going to be certified to offer outsourcing services to the lucrative North American market and compete with the well-known companies in Africa, Asia and Europe. He needs a name for the group. What about “Brilliant Group of Companies”, he thinks. It sounds good.

His challenge is to acquire good software to manage the Brilliant Group. This will be the first major project for Silicon. This software will be called “Group Software”. It will consist of modules to do many different things. They need packages to manage accounting (including all the company resources), Human Resource matters for the individual companies and the group, operations for each company, planning for the group as a whole and for the individual companies, and many other things as stipulated in the business plan. Group Software will be huge and extremely useful.

The structure of Brilliant Group is standard, with a president and vice presidents for each area in which the group is engaged. Each company in the group has a CEO, managers, department heads, including an accountant, and several officers and other workers depending on the needs of the individual company. Each employee receives a salary every fortnight or every month as the case may be. They are all entitled to annual leave and have other benefits depending on the positions they hold. The computer system must have a payroll module that calculates salaries, statutory deductions and other benefits. There is need also for a module that calculates leave due and there is mandatory assessment of each worker at the end of each year. This assessment is based on inputs from various company officers.

Silicon's job is challenging but with a well-trained work force it will be fun.

- a) As Silicon prepares to develop Group Software what are the major deliverables the VP for software development will be interested in seeing throughout the development process? **[2 marks]**
- b) Identify the actors and the use cases for the Human Resource module. Describe any 2 use cases in detail. **[12 marks]**
- c) Recommend a software process model for developing Group Software, explain the software process model and justify your choice. **[8 marks]**
- d) Identify the classes in Group Software, including the Human Resource module, and draw simple class diagrams. What aspect of the system do these class diagrams model? **[8 marks]**

Question 2 *Object-Oriented Design [15 marks]*

- a) Identify possible objects in the following system and develop a class diagram for it. You may make any reasonable assumptions about the system when deriving the class diagram. **[10 marks]**

A group diary and time management system is intended to support the timetabling of meetings and appointments across a group of co-workers. When an appointment is to be made that involves a number of people, the system finds a common slot in each of their diaries and arranges the appointment for that time. If no common slots are available, it interacts with the user to rearrange his/her personal diary to make room for the appointment.

- b) Draw a sequence diagram showing the interactions of objects in a group diary system when a group of people arrange a meeting. **[5 marks]**

Question 3 *Rapid Software Development [15 marks]*

- a) Explain how the principles underlying agile methods lead to the accelerated development and deployment of software. **[5 marks]**
- b) Explain why test-first development helps the programmer develop a better understanding of the system requirements. What are the potential difficulties with test-first development? **[5 marks]**
- c) A charity has asked you to prototype a system that keeps track of all donations they have received. This system has to maintain the names and addresses of donors, their particular interests, the amount donated and when the donation was made. If the donation is over a certain amount, the donor may attach conditions to the donation. (e.g. it must be spent on a particular project), and the system must keep track of these and how the donation was spent. Discuss how you would prototype this system, bearing in mind that the charity has a mixture of paid workers and volunteers. Many of the volunteers are retirees who have had little or no computer experience. **[5 marks]**

Question 4 *Software Evolution [15 marks]*

- a) State Lehman's Laws on continuing change, increasing complexity and declining quality. Under what circumstances might Lehman's Laws break down? **[5 marks]**
- b) What is software re-engineering? A system is developed and delivered to its users. Explain what evolution the system is likely to go through from this point onwards until it is scrapped. **[10 marks]**

END OF QUESTION PAPER