The Open University of Sri Lanka
Department of Electrical and Computer Engineering

ECX4237 – Software Engineering I
Final Examination – 2009/2010

(Closed Book Test)

Date: 17th March 2010	Time: 9.30 – 12.30 hrs

You must answer question 1 from Part A and any 3 questions from Part B.

Part A   Answer all questions considering the scenario given below.

> *Cycle bazaar sells and repairs bicycles for its customers. It also assembles customized bicycles to suit different customer needs.*
>
> *Each bicycle is assembled from 3 components: a frame, wheels, and a seat. Each of these bicycles is allocated a unique serial no, a cost, retail price, and 12 months warranty from the date assembled. Cycle Bazzaar uses seats, frames and wheels from a few manufacturers. They keep details of which manufacturer supplies which brand of frame and which brand of wheels etc.*
>
> *Cycle Bazzar keep details of each bicycle sale made, including the date of sale and the price paid as well as customer details such as name, address, telephone number.*
>
> *When bicycles are brought for repairs, details for each repair including the date bicycle was brought in, reference number if it was assembled in-house, estimated completion date, and a description of the repair required is stored.*

Please state your assumptions clearly when answering the questions.

(1)   (a) Describe functional and non-functional requirements of the system.   (10 marks)

     (b) Draw a use case diagram.   (10 marks)

     (c) Draw a class diagram with attributes, operations and relationships. (Logical database schema)   (20 marks)

Part B Answer only three (3) Questions

(2)   (a) What are the main steps of the process for capturing requirements?   (4 marks)

     (b) List 3 types of non-functional requirements. Briefly explain them with examples.

         (6 marks)

     (c) Re-write the following requirements so that they can be objectively validated. You may make any reasonable assumptions about the requirements.

         (i) The system should respond quickly even when the maximum number of users is in the system.

         (ii) The software must be developed in a way that is easy to use.

         (6 marks)

(d) Why do we want requirements to be testable? How do you test a Software Requirement Specifications? (4 marks)

(3) (a) List and briefly explain three strengths of the evolutionary lifecycle. (3 marks)

(b) List 5 factors that should be considered when selecting a software process model. (10 marks)

(c) What are the strengths of spiral lifecycle compared to waterfall in terms of the factors that project managers have to consider when choosing a process model? (4 marks)

(d) Why is risk management particularly important in software projects? (3 marks)

(4) Consider the following relational schema for a database called *Car-hire* that holds data about car hiring company. Each customer may hire cars from various outlets in different locations (such as Matara, Kandy etc) on any given date.

Car-hire (Car_no, Manufacturer, Model, Cust_no, Cust_name, Cust_contact_No, Hire_date, Return date, rate_per_day, rate_per_km, Outlet_no, location)

(a) Draw an E-R diagram for the given data. Underline the primary key. Clearly show the cardinality. (08 marks)

(b) Normalize the data up to 3rd normal form. Indicate the primary keys. Use functional dependency diagrams where necessary. (12 marks)

Write clearly, any assumptions that you need to workout the answers.

(5) (a) What are the two major types of testing? Briefly explain. (6 marks)

(b) What is a test plan? (3 marks)

(c) Why is it essential to have a test plan in any software project? (4 marks)

(d) What are the benefits of test automation compared to manual testing? (4 marks)

(e) List 3 features that a test case should posses in-order to benefit from automation. (3 marks)

(6) (a) What is the technique in object oriented programming that hide the internal data from the outside world, and allows access only through publicly exposed methods? (2 marks)

(b) Why must an object-oriented programming language support polymorphism? (3 marks)

(c) Consider the following UML class diagram fragment and the associated description of a video library. Identify the attributes and operations of the 'video' class. (15 marks)

P.T.O.

- Members of the video library borrow videos from the library for a given membership.
- When videos arrive at the library they are catalogued and entered into library information system.
- As soon as cataloguing is completed the videos are placed on the shelves ready to be borrowed.
- When a member borrows a video a borrowing fee must be paid.
- When the video is returned within due date it is placed in the office for checking and then returned to the shelves ready to be borrowed.
- If the videos are not returned before the due date it is marked as overdue and an email is sent to the member who borrowed it.
- When an overdue video is returned, a fine must be paid. It is placed in the office for checking and then returned to the shelf.
- If an overdue video is not returned within 3 months it is marked as lost in the video library information system.
- If a video is five years old and has not been borrowed within the last year it is taken from the shelves and marked 'retired' in the library information system.
- Three months after they have been marked 'lost' or retired they are deleted from the information system.