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

**ECX4237 – Software Engineering I**
**Final Examination – 2010/2011**

*(Closed Book Test)*

| Date: 3rd April 2011 | Time: 11.00 – 1.00 hrs |

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

**Part A    Answer question 1 considering the scenario given below.**

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*Comfort Air Ltd, is a travel agency in Sri Lanka. They have decided to get a software system developed to enable its customers book and purchase air tickets from the web.*

*When a person first comes to book a ticket through Comfort Air Ltd. he/she get registered as a customer.*

*When booking a flight a customer should be able to specify a departure and destination airport and indicate the date he/she wants to travel. In order to avoid typing errors the system presents the customer with all the direct flights available for the route and date indicated along with the prices for single and return trips. These flights may be operated by different air-lines.*

*The user may book one of these flights by pressing a book-flight button available on the screen. This form must be filled with the details of the customer including his/her surname, initials, title, address (street, no, city, postcode), telephone number and email address. If the user is a registered customer of Comfort-Air he/she can simply provide the customer-registration number and the system will find all these details.*

*When the customer provide required details and submit the filled form the system will check if the address information given is a valid Sri Lankan address and if so it will make the booking. The customer will be given booking reference number. Alternatively customer may decide not to proceed with the booking.*

*To purchase a ticket, customer may call or come in person to the travel agency and ask to issue the ticket he/she booked. The travel agency operator asks for the booking reference number to verify customer details and ask customer to confirm the reservation details. Then the ticket can be issued after the payment is processed. Payment can be either by credit card or cash. (payment process details are purposely omitted )*

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Please state your assumptions clearly when answering the questions.

(1)     (a) Draw a complete use case diagram to illustrate the given requirements.          (15  marks)

(b) Draw a class diagram with attributes, relationships and operations to support processes  in the use case diagram.                                                                                         (25  marks)

**Part B  Answer only three (3) Questions**

(2)  (a) What are the reasons for the software developers to use an *engineering approach* in the development of software?

(2 marks)

(b) Assume you are to develop a software product which is identified as containing a number of technical risks as well as customer related risks. Which life cycle model would you adopt? Justify your answer.

(4 marks)

(c) Under what circumstances and for what type of applications should development team consider using prototype development method?

(4 marks)

(d) Can prototyping be used with any other development methodologies? Explain the reasons for your answer.

(2 marks)

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

(8 marks)

(i) The system should be reliable.

(ii) The system should have enough security.

(3)  (a) What benefits do you expect from a *test plan*? Are there circumstances under which these benefits would *not* justify the investment in developing the plan?

(4 marks)

(b) When does the code reviews are carried on code? List the review techniques performed by the development team.

(3 marks)

(c) A function accepts marks in the range of 0 to 100 as an input and calculates the grade for a given value. Define the test cases using the boundary value analysis for equivalence classes for black box testing.

(9 marks)

(d) In a particular software project, all modules have undergone *unit testing* and they work well. Do we still need to have *integration testing*? Justify your answer.

(4 marks)

(4)  (a) The table below shows customer car hire data.  Each customer may hire cars from various outlets in different locations (such as Matara, Borella etc) on any given date.

(Write clearly, any assumptions that you need to work out the answers.)

| Vehicle_ reg_no | Manufact urer | Model | Cust_no | Cus_name | Hire_date | Outlet _no | Outlet_ Name |
|---|---|---|---|---|---|---|---|
| WC250 | KIA | Sorento | CN100 | Perera, A | 10/03/11 | 2 | Borella |
| WC250 | KIA | Sorento | CN300 | Silva, D | 11/03/11 | 2 | Borella |
| VH456 | Toyota | Premio | CN100 | Perera, A | 12/04/11 | 2 | Borella |
| WR204 | KIA | Sorento | CN402 | Bandara C | 12/04/11 | 3 | Matara |
| WR204 | KIA | Sorento | CN100 | Perera, A | 13/04/11 | 3 | Matara |
| RS500 | Toyota | Premio | CN300 | Silva, D | 10/05/11 | 3 | Matara |

(i) The data in the table is subject to *update anomalies*. Provide examples of how *insertion*, *deletion* and *modification* anomalies would occur on this table. (06 marks)

(ii) Normalize the data up to 3$^{rd}$ normal form. Indicate the primary keys. Use functional dependency diagrams where necessary. (10 marks)

(b) A data model fragment says that an 'Employee' is employed by a 'Store'. The 'Store' can have zero, one or or multiple 'Employees'. If an employee exists, a relationship to a 'store' is mandatory. However, an 'Employee' can only work for one store. Draw Entity-relationship diagram for this requirement clearly showing the cardinality. (You may assume the attributes necessary) (4 marks)

(5)   (a) List 5 management activities in a software project. (5 marks)

(b) What is software configuration management (CM)? Briefly explain. (5 marks)

(c) Describe how software process factors influence software quality and productivity. (5 marks)

(d) What are the quality assurance activities that should include in a software project? (5 marks)

(6)   (a) Briefly describe the 3 estimates to be produced by a software manager regarding a project? (6 marks)

(b) What are the types of cost that should be considered in cost estimation? Briefly explain. (6 marks)

(c) What is the main advantage of using functions or object points compared to estimates of program size in lines of code? (4 marks)

(d) List the program features that are estimated when computing the number of function points in a program. (4 marks)