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

082

ECX4237 – Software Engineering I
Final Examination – 2008/2009 ***(Closed Book Test)***

Date: 23rd March 2009 **Time: 14.00 – 17.00 hrs**

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

Part A Answer Question 1 or Question 2 using the scenario given below.

OUSL Help Desk Scheduling

The OUSL IT division is proposing to have a help desk dedicated to providing IT user support for its employees. They need a software system for scheduling service tasks to its Technical Officers (TO) when a service request come to the operator at the helpdesk.

The major task of the system is service request management process. First the service request must be received via phone call or email. After establishing the identification of the notifying person, the service request is pre-screened. i.e. if the incident is very simple and can be solved by the operator over the phone it doesn't have to be allocated to a TO. (However it should be logged.)

Otherwise the incident should be logged with basic information, a reference number (job number) is given back to the notifying person and a record is started for the particular service request. A priority code is assigned based on how serious the problem is for users and how many users are affected. According to the priority code requests are handled but a maximum waiting time period is given for all the jobs without considering the priority so that low priority tasks are not be kept waiting indefinitely.

According to the basic information, priority code and the skill level of the TO, jobs are assigned to TOs . As a record is kept for each job, the status of the job can be inquired by giving the reference number.

Once a job is completed the record is closed.

Please state your assumptions clearly when answering the questions.

1 (a) Draw a use case diagram. (20 marks)
(b) Draw a class diagram with attributes, behaviours and relationships. (20 marks)

OR

2 (a) Draw Data-Flow-Diagrams (DFDs) for the system (starting from level 0 DFD up to Level 2) (30 marks)
(b) Describe non-functional requirements of the system. (10 marks)

Part B Answer any 3 questions.

3. (a) Assume you were to plan the development of a product with a large number of technical as well as customer–related risks. Which life cycle model would you adopt? Justify your answer. (3 marks)

   (b) What are the drawbacks of prototyping? (5 marks)

   (c) What are the non-functional requirements of a system? (2 marks)

   (d) 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 provide acceptable performance under maximum load conditions.
   (ii) The software must be developed in a way that inexperienced users can use it.
   (10 marks)

4. Consider the following relational schema for a database called ***Books*** that holds data about books in a library.

   Books(Title, ISBN, Author name, Author nationality, Author address, publisher name, publisher address, total_copies_ordred, Copies_in_hand, publication_date, category, category_description)

   Assume the following,
   - ISBN number is unique
   - A book may have more than one author
   - An author may have written more than one book
   - Each publisher name is unique and each publisher has a unique address.
   - Titles are not unique
   - Each book has only one publication date and one publisher. A revision of a book is given a new ISBN.
   - Categories are unique. Categories could be: biography, poetry, computer vision etc.

   Write clearly, any other assumptions that you need.

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

   (b) Normalize the data upto 3rd normal form. Indicate the primary keys. (12 marks)

5. (a) How does the object-oriented concept of message passing help encapsulate the implementation of an object, including its data? (3 marks)

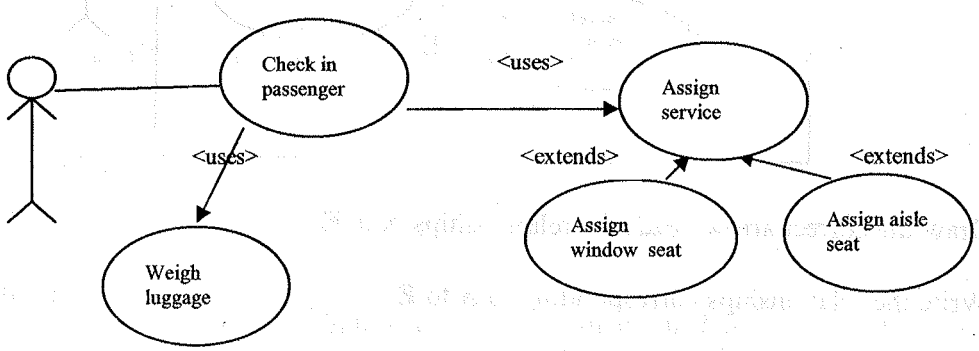
(b) Draw the association multiplicities for following scenario about the grades of school principals. (6 marks)

*Consider two classes in an object oriented design called **grade** and **principal**. A **grade** need not be associated with any **principal**, or it can be associated with an indeterminate number of **principals**; a **principal** must be associated with one or more **grades**.*

(hint: school principal promotions can go up to grade I to grade III)

(c) What is the difference between composition and aggregation? (3 marks)

(d) Describe the use case diagram below in your own words explaining the relationships between the processes. (8 marks)



6. (a) What benefits do you expect from a test plan? (4 marks)

(b) What are the tests that should be applied to a simple loop where n is the maximum number of allowable passes through the loop? (4 marks)

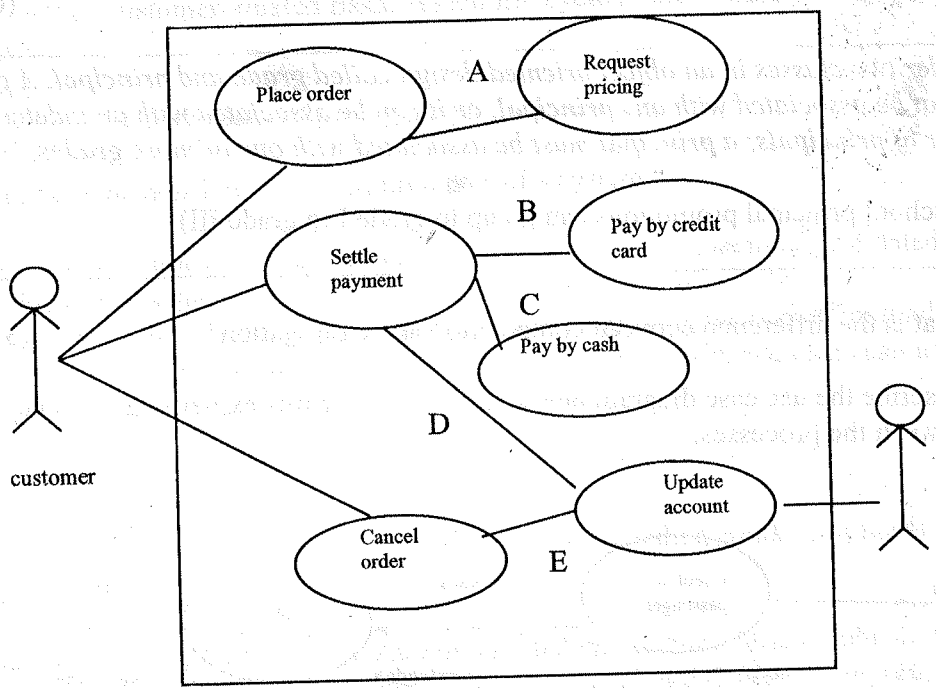
c) Consider a program with two '**For**' loops, controlled by index variables. The first variable increments (by 1 each iteration) from 1 to 20. The second variable increments (by 2 each iteration) from 1 to 10. The program can exit only after both loops are executed. (Ignore the possibility of invalid values of the loop index.)

If these were the only control structures in the program except statements in sequence, how many paths are there through the program for testing (you may draw diagrams to illustrate),

i) If the loops are nested? (6 marks)

ii) If the loops are in series, one after the other? (6 marks)

7. The system given below shows a use case diagram extracted from a goods order system. The use cases participate in relationships between themselves (**A** to **E**). These relationships can be as follows: extend, generalization, and include.



(a) Draw the correct arrow heads for relationships **A** to **E**. (5 marks)

(b) Write the relationships corresponding to **A** to **E** (5 marks)

(c) Write a use-case narrative for the given scenario. (include: Use- case name, pre-conditions, post conditions, description, primary actors, etc) (10 marks)