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

ECX4237 – Software Engineering I
Final Examination – 2011/2012 *(Closed Book Test)*

Date: 24th March 2012	**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.

A system is to be developed for the Central Environment Authority (CEA) to be used in reservation of Circuit Bungalows and campsites close to National parks.

Currently all the reservations are done manually in the office located in Colombo. The proposed system should have the facility to make reservations from the head office or any regional office. There are 9 National parks each having several bungalows and campsites. In each circuit Bungalow there are 3-4 rooms, verandah, dining area and kitchen. Some Bungalows are air conditioned.

Reservations are done through ticketing officers by paying the full amount by cash. There are several ticketing officers attached to the Head office and the regional offices. Reservations are done from 9.00am -5.00 pm. The proposed system should have the facility to reserve Bungalows or campsite on-line and make payments using credit cards.

At the time of reservation, ticketing officer will take personal details of each customer and accompanying persons and children. They should also say what type of accommodation, the period of stay, expected check-in date and mode of payment. If a reservation cannot be made due to unavailability, it is possible for the customer to make a pending reservation.

A customer can cancel a reservation anytime. 10% will be charged if the cancellation is done 48 hours before the checking date or 35% will be charged.

Reservations may be cancelled due to bad weather. Certain campsites may be flooded during rainy seasons. When such a situation arises the person in charge of the Bungalow or campsite will inform the Head office or regional office. A message will be published regarding cancellations and the customers who have already made the reservations will be informed. In such cases they can collect refund from Head office or any Regional office.

The proposed system should have a facility for the ticketing officers, regional managers to find out the reservations and availability of Bungalows and campsites for a given day or a period.

Please state your assumptions clearly when answering the questions.

Question 1

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

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

Part B Answer only three (3) Questions

Question 2

(a) Compare and contrast functional and non-functional requirements with examples. (6 marks)

(b) When is prototyping most suitable in the process of software development? (2 marks)

(c) How could Prototyping be used to improve the quality of requirements? (3 marks)

(d) What benefits do the users get from prototyping? (4 marks)

(e) List 5 factors that should be considered when selecting a software process model to develop a software system for a given problem. (5 marks)

Question 3

(a) List down simple risks that you can identify in a test plan. (4 marks)

(b) Describe how software process factors influence software quality and productivity. (4 marks)

(c) "*Software configuration management* is the management of change throughout the whole of the software life cycle".
Describe the basic steps involved when performing configuration management. (4 marks)

(d) Under what circumstances would you recommend the use of the staged representation of the CMMI? (3 marks)

(e) What is the difference between generic and specific goals in the CMMI? (2 marks)

(f) "A software system that is used in a real-world environment must change or become progressively less useful". Do you agree with this statement? Justify your answer. (3 marks)

Question 4

Answer the following questions (a to d) regarding the given pseudo code.

```
integer A, Integer B
Read A
Read B
If A < B then
        Print 'A is the smaller number'
Else
   If A == B then
      Print 'they are same'
   Else
      Print 'B is the larger number'

Endif
```

(a) Draw a flow graph. (4 marks)

(b) What is the Cyclomatic Complexity for this flow graph? (2 marks)

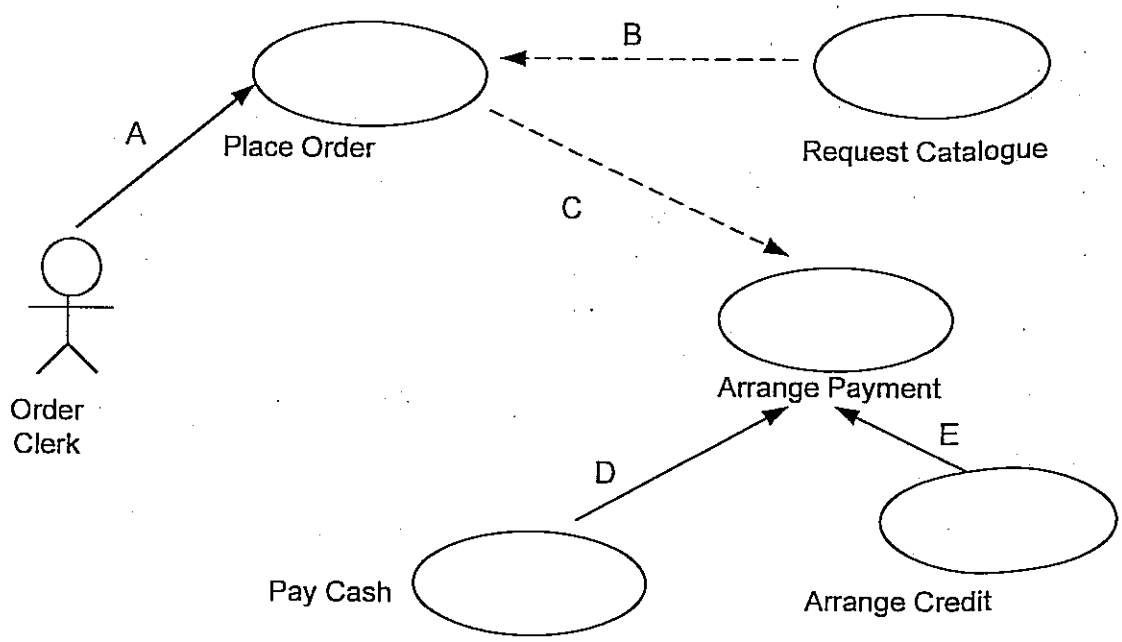
(c) What is the statement coverage and what is the minimum number of test case required to achieve 100% statement coverage? Write the test cases. (4 marks)

(d) What is the minimum number of test cases required to achieve 100% decision coverage? Write the test cases. (4 marks)

(e) Name 2 different types of testing that are be done by the development team and 2 different types of testing that are done by testing team. Define what functionality is tested in each case. (8 marks)

Question 5

(a) Consider the following UML diagram.



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

(ii) Write a use-case narrative for the given scenario. (include: Use- case name, pre-conditions, post-conditions, description, primary actors, etc) (5 marks)

(b) Briefly describe the terms *inheritance*, *polymorphism* and *encapsulation* regarding an object oriented programming language. (7 marks)

Question 6

(a) The student affairs division of the Open University has decided to maintain a database about students who join various associations and sports teams of the university. The

information needed for this database are: student registration number, name of the association (e.g. literary society, Buddhist society, cricket team, computer society etc), date that a student join an association or a team and a student's personal data such as name, address, email address, age, and enrolled faculty.

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

(i) Assume that the person who designs the database has decided to have all information in a single relation. Give 2 sample datasets. (3 marks)

(ii) Using the above relation discuss any two insert, delete or update anomalies that could occur. (2 marks)

(iii) Identify functional dependencies among attributes and normalize the data up to 3rd normal form. Indicate the primary keys. (6 marks)

(b) Convert the following ER diagram to the relational database model. (9 marks)