THE OPEN UNIVERSITY OF SRI LANKA
BACHELOR OF TECHNOLOGY – LEVEL 04
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

ECX 4237 – SOFTWARE ENGINEERING I

Final Examination – 2014 / 2015 *(Closed Book Test)*

Date: 05th September 2015 **Time: 9.30 – 12.30 hrs**

<INSTRUCTIONS>

1. Answer **Question 1** in **Part A**, which is compulsory.
2. Answer **3 questions out of 4** given in **Part B.**
3. This is a closed book exam and no reference books and materials are allowed.

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

Part A (Compulsory question 40 marks)

Answer all parts of question 1 considering the scenario given below.

The Director Board of 'Achievers International School' has decided to get a Meeting Scheduler System (MSS) developed that would solve their problems in arranging meetings. Given below is a list of functions be considered when developing the MSS system.

- *A meeting initiator (E.g.: Chairman/ CEO/ Academic Head) creates a meeting within the system with a range of dates and times within which the meeting can occur, the name of the meeting, the desired location, and the duration of the meeting.*

- *The meeting initiator can add/remove potential participants to a meeting at any time. A potential or actual participant can also remove himself from the meeting.*

- *The meeting initiator can invite potential participants. Potential participants are given date range and asked to provide dates/times when they are unable to attend (called the exclusion set). They are given a fixed amount of time in which to reply.*

- *Potential participants interested in attending the meeting contact the MSS and provide the requested exclusion set of dates and times. If they have not responded within the given fixed amount of time they are informed and their requests are rejected.*

- *At any point after participants have been invited to attend the meeting, the initiator may ask the MSS to plan a suitable date and time for the meeting based on participant constraints. The planned date should be returned along with information about any conflicts.*

- *If date conflicts have occurred the initiator requests the MSS to contact (negotiate with) affected potential participants asking them to inform the system whether they would still like to attend or whether they would like to be removed from the meeting list. The participants affected must contact the MSS within a given period of time otherwise they are considered to have removed themselves from the meeting.*

- *The initiator may list meetings details.*

- *The initiator may list a meeting's current participants and their status (replied to invitation etc).*

- *The initiator may cancel a meeting, whereupon all participants are informed and the meeting is removed from the system.*

Question 1

a) Draw a complete use case diagram to illustrate the given requirements. (20 marks)

b) Draw a class diagram with attributes, relationships and operations to support the business processes in the use case diagram. (20 marks)

(State your assumptions clearly)

Part B Answer only three (3) Questions (20 marks each)

Question 2

a) What are the characteristics of structured methodologies of programming? (2 marks)

b) One aspect in software maintenance is detection and repair of defects. Briefly describe how Object oriented programming eases this operation in contrast to structured programming? (4 marks)

c) What is software Configuration Management (CM)? (4 marks)

d) Briefly describe the relationship between CM and software maintenance. (4 marks)

e) Compare and contrast organizational aspects of software maintenance and technical aspects of software maintenance. Tabularize your answer. (6 marks)

Question 3

Consider following scenario given regarding an airline ticketing agency.

They keep information regarding Flights which include flight_num, source_city and destination_ city, and departures with flight_num, date and plane type. Passengers can book a flight giving their passport_number, name,address, contact_number and flight details. When booking a flight by the ticket agency they allocate a seat_number.

State your assumptions clearly.

a) Explain why Normalization is important in database design. (3 marks)

b) Draw an E-R diagram illustrate the given scenario. (7 marks)

c) Convert the E-R diagram to a set of Normalised tables indicating primary and foreign keys. (10 marks)

Question 4

a) What is the process model you would select for a medium size software system, if it is given that; the phases of software construction are interleaved, i.e. In several stages, and user feedback is necessary throughout the entire process as the requirements are not well understood. Justify your answer. (7 marks)

b) A legacy system is often very old, developed on old technology but large. Usually had been heavily modified without documentation. Why is it important to maintain a legacy system? (4 marks)

c) Briefly describe what is meant by reverse engineering of a legacy system. (4 marks)

d) Suggest circumstances where it is appropriate to use a fault-tolerant architecture when implementing a software based control system and explain why this approach is required? (5 marks)

Question 5

a) Why must you load test an application? Give 3 reasons. (4 marks)

b) What is the type of testing conducted based on an analysis of the specification of a piece of software without reference to its internal workings? (2 marks)

c) Draw a flow graph for the procedure given in page 4. (10 marks)

d) Determine Cyclomatic Complexity of the resultant flow graph in c) (4 marks)

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PROCEDURE AVERAGE_of_VALID_NUMBERS  (Address of an Array of integers:Value)

CONSTANT minimum = 0, maximum = 100;
i = 1; total_input = 0, total_valid =0; sum = 0;

DO WHILE  inputs = < 100
        Increase inputs by 1
        IF value[inputs] >= minimum AND value[inputs] <= maximum
                THEN increment total_valid by 1;
                Sum = sum + value[inputs];
        ENDIF
END DO
        IF total_valid  > 0
                THEN average = sum/total_valid;
        ELSE print 'No valid inputs'
ENDIF
END procedure AVERAGE_of_VALID_NUMBERS
```