The Open University of Sri Lanka
Faculty of Engineering Technology 044
Department of Electrical and Computer Engineering

Study Programme:	Bachelor of Technology Honours in Engineering
Name of the Examination :	Final Examination
Course Code and Title :	EEX4347 Software Engineering Concepts
Academic Year :	2021/2022
Date :	28 February 2023
Time :	09:30 -12:30hrs
Duration :	3 hours

General Instructions

1. Read all instructions carefully before answering the questions.
2. Answers should be written in answer book provided. Answer for each question should commence from a new page.
3. This question paper consists of Four (04) questions in four (04) pages.
4. Answer all questions.
5. This is a Closed Book Test (CBT).
6. Answers should be in clear handwriting.
7. Do not use red colour pen.

Read the following description of a Bartering system (exchange of goods and services without the involvement of money) to be implemented by a startup company.

Bartex - An online bartering system

"BEX" is an a startup company that wants to create an online barter exchange system called Bartex. The purpose of developing Bartex is to overcome the limitations associated with the use of traditional money for buying and selling goods and services. In Bartex, customers, both business and individual, can exchange goods and services based on the availability and user needs. BEX needs the help of a Software Engineer to provide a plan to carry out the requirement elicitation process before building the system because the founders of BEX have understood that having good Requirements is an important part of any system development activity.

In the bartex system, each customer will be assigned a page where he/she can maintain a catalog of goods and services offered by him/her. Customers can browse the items listed and propose a bartering transaction. For example, "I would like to exchange 1 kilo of mangoes for 1 medium jackfruit offered by you". Each item listed in the catalogue should have an expiry date for the good or the service. The system should automatically remove the items or services past their expiry date. Customers may also list desired items on their own page, for example, "I have 2 kilos of rice that I want to exchange for 5 large mangos".

The system will display the number of bartering transactions completed by each customer. Once a transaction is completed both parties may leave a review score for the other party. The review scores will be displayed on each customers' page.

Each customer of the Bartex system should register before using the system.

Question 1 (30 Marks)

a) What is the importance of carrying out a requirement elicitation before building a new system? (3 Marks)

b) One of the requirement elicitation techniques is "Interviewing". BEX would like to conduct Interviews as part of the requirement elicitation process. Prepare a plan outlining the steps for BEX to conduct interviews for the proposed system - Bartex. Your plan should be complete such that a non-expert could carry out the steps in the plan to elicit the requirements of the new system. Your answer should include at least 2 different stakeholders and 3 questions for each stakeholder that will help elicit the requirements for those stakeholders. (6 Marks)

c) Identify and briefly describe 4 characteristics of a good requirement. (5 Marks)

d) Identify 3 reasons why the development of the Bartex system may fail and describe what the founders of BEX can do to mitigate the risks of failure. (6 Marks)

e) List and describe 4 techniques that can be used to maintain Bartex system software. (10 Marks)

Question 2 (20 Marks)

Answer the following questions in relation to the Bartex System described at the beginning of the paper.

a) Draw a Use Case diagram to represent the system requirements of the Bartex System. Clearly state any assumptions you make. (10 Marks)

b) Draw a conceptual model for the Bartex System using an ER diagram Clearly state any assumptions you make. (10 Marks)

Question 3 (20 Marks)

Consider the following database structure used by a restaurant to maintain a user review system. The user can give a review rating and can add a comment to each review as well. The following database structure was used to record this information.

Customer(CustID, Name, Email, Password, RegistrationDate)

MenuItem(ItemId, ItemName, Description, Category, Price)

Review(ReviewID, UserID, ItemID, Rating, ReviewDate)

Comments(CommentID, ReviewId, USerID, Description, CommentDate)

a) What is the importance of Normalization in database design? (4 Marks)

b) Write down SQL queries for the following tasks

i. List down all the details of all menu items listed in the database. (2 Marks)

ii. List down items that have received rating of less than 3. (3 Marks)

iii. List down the customers who have given rating 5 with the menu item that received the rating. (3 Marks)

iv. List down the menu item that has received the highest number of ratings and the average of the rating. (4 Marks)

v. Explain what actions you would take to ensure the consistency and security of the database. (4 Marks)

Question 4 (30 Marks)

Consider the following scenario to answer the questions Q4 (b) - Q4 (f).

The Center for Education Services (CES) conduct many different training programs. These training programs belong to two main categories: Short Course and Certificate Courses. Details (IdNumber, name) of students need to be recorded. A course is represented by a course code, and a title. A course code is a four-digit integer where the first digit represents the level of the course, the second digit represents the credit value and the last two digits a sequence no. For example, the course code 1234 represents a level 1 course with a credit value of 2. A credit is equivalent to 25 study hours. The course fee of a credit is LKR 3500.00 which is a fixed value that cannot be changed by any of the subclasses. A Certificate Course need to store the final evaluation while the Short Courses do not have final evaluations.

You are required to write valid Java code for the following questions.

You should follow the principle of information hiding when declaring variable and methods.

a) Explain the use of the two keywords **super** and **this** in Java programming language. (2 x 2 = 4 Marks)

b) Define a class called **Course** to represent any training program conducted by the CES. (2 Marks)

c) Define two classes called **ShortCourse** and **CertificateCourse** to represent ShortCourse and CertificateCourse. (2 x 2 = 4 Marks)

d) Define constructors for the Course class to represent the following situations:

   i. A default constructor that will initialize all attributes with 0, empty string or null as appropriate. (2 Marks)

   ii. A constructor that takes Course Code and the Title as arguments and initialise the corresponding members. (2 Marks)

e) Define a method in the Course class called getCourseFee that will calculate and return the course fee of a course. (4 Marks)

f) Define a class called TestCourse. Define a main method that will create a short course titled "Prompt Engineering" with a course code 2365. Use the getCourseFee method to calculate the course of the course and print the Course Code, Credit value and the CourseFee with appropriate messages. (6 Marks)

g) Explain how you would verify the correctness of the above program. (6 Marks)