

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



Study Programme	: Bachelor of Software Engineering Honours
Name of the Examination	: Final Examination
Course Code and Title	: EEI4366 Data Modelling and Database Systems
Academic Year	: 2022/2023
Date	: 1 st November 2023
Time	: 0930 - 1230 h
Duration	: Three (3) hours

General Instructions

1. This Exam is a **Closed Book Test**.
2. This question paper consists of **four (4)** questions in **two (2)** pages.
3. Answer all **four (4)** questions. Answer for each question should commence from a new page.
4. Use blue or black ink pen to answer the questions.
5. Clearly state your index number and registration number in your answer script.

Question 1 (30 Marks)

A. Create a EERD for the following scenario:

Student: Student ID, First Name, Last Name, Date of Birth, Email
 Course: Course Code, Title, Credits, Description
 Professor: Professor ID, First Name, Last Name, Email, Department
 Department: Department Code, Name, Office Location
 Class Enrollment: Enrollment ID, Enrollment Date, Grade

Each student can enroll in multiple courses, and each course can have multiple students. Each course is taught by one professor, but a professor can teach multiple courses. A department can offer multiple courses, and each course is offered by one department. Multiple students can enroll in specific class sections (class offerings), and each class section belongs to one course.

(12 Marks)

B. Enhance the EERD you have developed by referring to the below lists.

- i. Introduce an "Undergraduate Student" and "Graduate Student" specialization under the "Student" entity to capture attributes specific to each student type.
(03 Marks)
- ii. Create an "Academic Advisor" entity to represent the relationship between professors and students who serve as academic advisors. Professors can advise multiple students, and each student has one academic advisor.
(06 Marks)
- iii. Introduce an "Enrollment History" entity to capture historical data about class enrollments, including enrollment dates and past grades. This entity links students, class sections, and courses.
(06 Marks)
- iv. Add constraints to attributes such as "Grade" to ensure valid data entry, like allowing only certain grade values (A, B, C, etc.).
(03 Marks)

Question 2 (30 Marks)

Consider the following table and write SQL queries for the questions given below.

CREATE TABLE Customer (CusNo INT PRIMARY KEY, Name VARCHAR(255) NOT NULL, Address VARCHAR(255), CusPhone VARCHAR(20));

CREATE TABLE Performance (PerfNo INT PRIMARY KEY, Date DATE NOT NULL, Theater VARCHAR(255) NOT NULL);

CREATE TABLE Seat (SeatNo INT PRIMARY KEY, Area VARCHAR(255) NOT NULL, Theater VARCHAR(255) NOT NULL, UNIQUE (Area, Theater)); -- Ensures each seat is unique within a specific area and theater

CREATE TABLE TicketBooking (TicketNo INT PRIMARY KEY, IssueDate DATE NOT NULL, CusNo INT, PerfNo INT, SeatNo INT, seatStatus VARCHAR(50) NOT NULL, FOREIGN KEY (CusNo) REFERENCES Customer(CusNo), FOREIGN KEY (PerfNo) REFERENCES Performance(PerfNo), FOREIGN KEY (SeatNo) REFERENCES Seat(SeatNo));

- A. Find customers who booked tickets in multiple theaters. (06 Marks)
- B. Find the most popular theater (theater with most bookings). (08 Marks)
- C. List all performances for which all seats are booked. (04 Marks)
- D. Calculate the total number of seats booked in each area for a specific theater. (08 Marks)
- E. List all the customers who have not booked tickets. (04 Marks)

Question 3 (20 Marks)

- A. What is database normalization, and why is it important in database design? (05 Marks)
- B. How does UML support the software development life cycle, from requirements analysis to implementation and testing? (05 Marks)
- C. What are Anomalies in a database and explain the three main types? (06 Marks)
- D. What is a database trigger, and why would you use it? (04 Marks)

Question 4 (20 Marks)

- A. Write 04 steps that a database administrator will follow to ensure security in a database system. (04 Marks)
- B. What is the purpose of database indexes in data storage? (04 Marks)
- C. What is the purpose of XML schemas in database applications? (03 Marks)
- D. Write short note for the following:
 - i. Subclass and superclass in ER modeling (03 Marks)
 - ii. Rollback, Revoke commands in SQL (03 Marks)
 - iii. Stored Procedure in SQL (03 Marks)