Sri Lanka Institute of Information Technology

BSc Honors in Information Technology Specializing in Cyber Security

IE2042- Database Management Systems for Security

July 2024

Group Assignment

Database Design, Implementation and Security

Anticipated Learning Outcomes

LO1: Design and develop database solutions for real-world applications.
LO2: Apply relational query languages and database programming languages in database applications.
LO3: Evaluate query plans and recommend solutions to speed up the database servers.
LO4: Apply appropriate solutions to address security and performance concerns related to databases

Important Dates

Group Details Submission – 9th August 2024

Assignment Declaration – 12th August 2024

Assignment Deadline – 15th October 2024

Contribution to Final Grade

CA Weightage - 30%

Assignment Instructions:

- Group members will be allocated by the module team and made available on the course web.
- The LIC must approve any changes to the allocated assignment groups.
- Any non-approved changes to module teams will lead to a mark's penalty of 30%.
- Attend the viva at the end of the semester and defend your work, otherwise you will be awarded 0% for this assignment.

Part 1 – 65 Marks

- Analyze the given scenario and carry out the below tasks
  - Document any assumptions made. (5 Marks)
  - Develop the ERD and logical model. (15 Marks)
  - Normalize the logical model to 3NF. (5 Marks)
  - Implement the logical model in the MS SQL server and enter suitable sample data. (5 Marks)
  - Identify all necessary constraints and enforce them on the tables. (10 Marks)
  - Develop the required views, functions, procedures, triggers, and indexes as specified below. (25 Marks)
    - Identify 2 suitable triggers that can be applied to the database and explain and implement them. (5 Marks)
    - Identify the possible users of this database and create 2 views for them. (5 Marks)
    - Based on the below questions identify 2 indexes that will optimize the given queries and implement them. (5 Marks)
    - Write stored procedures to carry out the below DML functions. (10 Marks)
      1. Retrieve the details of all the items borrowed by a given member within a given period.
      2. Retrieve the outstanding fines for a given member.

Database Scenario: University Library Management System*

** Please note that the below scenario is not complete, you are expected to include additional entities, attributes, and relationships as required to complete this assignment and document the assumptions and justifications associated with those inclusions.*

The university library system is a comprehensive platform designed to manage a wide array of resources and users. The library houses various items, including books, journals, and digital media, each with unique identifiers and characteristics. For instance, books have attributes such as ISBN, author, and genre, while journals are identified by ISSN, volume, and issue. Digital media, on the other hand, are characterized by their format and size.

The library serves a diverse user base comprising students, faculty, and staff. Each user type has specific attributes: students have a major and year of study, faculty members belong to a department and hold a title, and staff members have designated positions and offices. All users share common attributes like name, email, and phone number.

Users interact with the library system primarily through borrowing and reserving items. When a user borrows an item, a transaction is recorded, capturing details such as the borrow date and return date. Similarly, when a user reserves an item, the system logs the reservation date. These transactions link users to the items they borrow or reserve, ensuring that the system can track the movement and availability of resources.

Each item in the library can have multiple copies. For example, there might be several copies of the same book or journal issue. Each copy has specific attributes such as CopyID, Condition, and Location within the library.

The library has a fine system in place. If a user burrows a book and does not return it or extend it within the specified time period (decided by the item type) there will be a fine levied on the borrower. There can be multiple fines on the same item that was borrowed depending on the delay.

Task for Students:

Identify the entities, attributes, and relationships in the scenario described above. Consider the following:

- **Entities**: Determine the main objects in the system
- **Attributes**: Identify the characteristics of each entity
- **Relationships**: Understand how the entities interact with each other.
- **Connectivity**: Consider the nature of the relationships, such as one-to-many or many-to-many.
- **Inheritance**: Recognize the "IS A" relationships where sub-classes inherit attributes from their super-classes.
- **Aggregation**: Recognize where a relationship takes part in another relationship.

Part 2 – 35 Marks

- Select and study two database vulnerabilities focusing on techniques and impact. (20 Marks)
- Understand how to mitigate the selected vulnerabilities and suggest countermeasures to overcome the selected vulnerabilities. (15 Marks)

Submission Procedure:

- Group leader should submit the **soft copy of the report (Max 2500 words)** through the assignment submission link available in the Course web on or before 15th October 2024.
- Assignment coversheet should indicate the details of all 4 members.
- The report should include the diagrams for the ERD. Logical Design and normalized tables showing functional dependencies.
- For the practical SQL you need to include Screenshots of the SQL codes you have written
- You are also expected to submit the SQL codes as a separate script.

- **Note:** Rename your submission with the group ID.

Marking Guide

Criteria	Marks
Task 1	
Properly Documented Assumptions	5
ERD and Logical Model	15
Normalization	5
Table Implementations	5
Constraints Implementation	10
2 Triggers	5
2 Views	5
2 Indexes	5
2 Stored Procedures	10
Task 2	
Description and analysis of 2 database vulnerabilities	20
Mitigation and countermeasure suggestions	15