MMIS103 – Database Management Systems & Design

Assignment 3 – SQL Scripting. ASP.NET with Backend Database and Research Report

Semester 2 2023

Submission Type: Compressed ZIP file (*.SQL (SQL Scripting); *.docx (Business report)

Due date: End of Week 12

50% of your overall grade

1 SQL Scripting (35 Marks)

LibraryDB is a database system that keeps track of information concerning books and their circulation in an imaginary library.

Disclaimer: The data that populates the database are artificially constructed and do not correspond to real-world data.

The schema for the LibraryDB database is given below.

```
BORROW(transactionID, personID*, borrowdate, duedate, returndate)
AUTHOR(authorID, firstname, middlename, lastname)
BOOK_COPY(bookID, bookdescID*)
BOOK(bookdescID, title, subtitle, edition, voltitle, volnumber,
      language, place, year, isbn, dewey, subjectID*)
BORROW_COPY(transactionID*, bookID*)
PERSON(personID, firstname, middlename, lastname, address, city,
       postcode, phonenumber, emailaddress, studentno, idcardno)
PUBLISHER(publisherID, publisherfullname)
WRITTEN_BY(bookdescID*, authorID*, role)
PUBLISHED_BY(bookdescID*, publisherID*, role)
```

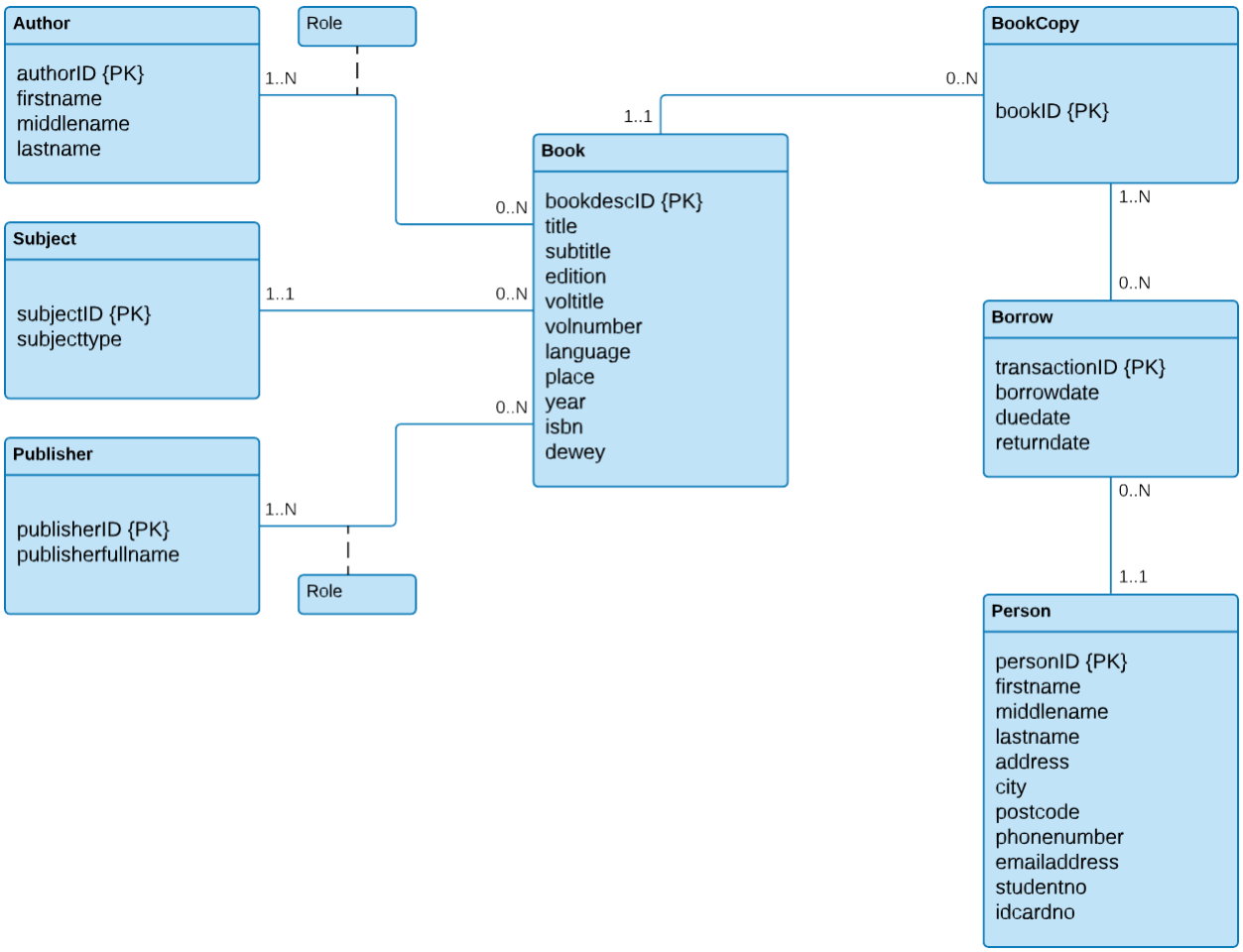
The primary keys are underlined. The foreign keys are denoted by asterisks (*).

Description of the schema

- person -- keeps track of the people who borrow books from the library. The attributes contain personal and contact information.
- author -- keeps track of personal information about authors.
- publisher -- keeps track of the publisher's information. To make it simple, most of the attributes have been truncated in the sample database.
- subject -- this relation keeps the information about the subjects on which the library collection has books (such as Mathematics, Database, etc.)
- book -- contains information about the books available in the library. Every book can have one or more physical copies in the collection. Each book can have one or more authors, published by one or more publishers.
- book_copy -- keeps track of the physical copies of the books in the library collection.

- `borrow` -- keeps track of the check-ins and check-outs of the books. Every transaction is done by one person. However, it may involve one or more book copies. If there is no return date, the book has been checked out but not returned.
- `written_by` -- associates books with authors. A book may be associated with several authors and an author may be associated with several books. There is also an attribute 'role' that specifies the role of the author for the book (author/ editor/ translator/ etc).
- `published_by` -- associates publishers with books. There is an attribute 'role' here too.
- `borrow_copy` -- associates physical copies of books with a transaction. Members are allowed to borrow several books in a single transaction.

A conceptual data model (an entity-relationship diagram) representing these data is given below.



If you wish to do this part of the assignment using your own computer, you must install Microsoft SQL Server Express Edition. The instructions for installing, configuring, and using Microsoft SQL Server Express Edition are provided along with Week 2 and 3 tutorial/lab material. Also you need to install Microsoft Visual Studio 2024 to do Part 2 of this exercise (ASP.NET application). **A sql file (library_db.sql) is given for this assignment.**

Write SQL queries on SQLite Studio for the following tasks.

1. **How can you retrieve a list of all books along with their respective authors using SQL?**

2. **What SQL query would you use to find all overdue books that have not been returned on time?**

3. **How can you identify books in the database that have never been borrowed?**

4. **What SQL statement allows you to determine the most borrowed book in the library?**

5. **How can you find publishers that have published more than one book using SQL?**

6. **What SQL query can be used to retrieve all students who have borrowed a book along with the details of their borrowed books?**

7. **How can you list all books along with their corresponding authors, including books that have no recorded authors?**

8. **What SQL query would you use to determine the number of books borrowed by each person?**

9. **How can you identify books that were borrowed but have never been returned?**

10. **What SQL query would help find students who have borrowed more than three books?**

2. ASP.NET with Backend Database Integration (25 Marks)

1. [15 marks] You have to connect to the Backend Database (created in Step 1) using ASP.NET Page.
2. [10 marks] Create, Read, Update and Delete (CRUD) activities to the database must be performed through server sided ASP script.

3. Business Report (40 Marks)

The XYZ council that the library belongs to decided to merge all libraries. This decision was taken with the announcement that all council systems' data will be stored in a single data warehouse to facilitate the collection and processing of data from the following systems.

a. The council HR system. SQL Database.
b. The customer relationship management system. SQL Database.
c. The council's payment, finance, and accounting application. SQL Database.
d. System supporting the council's mobile app data. SQL Database.
e. Systems supporting the council's presence on social media platforms like Facebook, X (formerly Twitter), YouTube, TikTok, and Instagram, data gathering and video streaming. These applications use a NoSQL database.

Task 1 [20 Marks]
<u>Identify</u> and <u>Justify</u> a Data Warehousing Solution for the XYZ Council.
You are assigned the task of producing an analysis of data infrastructure needs that can cater to the volume of data it is currently dealing with and projected growth over the next five years to set up a data warehouse. Here, you are free to make assumptions, such as projected population growth in the council area.

Your report must include a discussion of the pros and cons of the different data warehouse design methods and the justification for selecting a specific method with solid arguments to back up your claims and recommendations supported by research. The discussion must cover novel Data Warehousing solutions.

Task 2 [20 Marks]
<u>Identify</u> and <u>Justify</u> Database Security needs of XYX Council that cover every aspect of the systems and applications, including the proposed Dara Warehousing solution.
Research to determine potential vulnerabilities in the existing systems stemming from various sources, i.e., people, data, networks, etc. Identify viable security measures. Your work must go beyond preparing a list of vulnerabilities and present useful evidence from existing research to support your arguments for vulnerabilities and security measures. The research evidence must come from reputable sources or be written and published by reputable authors or publishers.

Appropriate Research evidence and presentation [5 marks]