**DBI202 - Assignment**

**Group 4 – Store Management**

**Department of Software Engineering**

**FPT University**

Major Professor: *Trần Lâm Quân*

**Member:**

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1. **Presentation of problem:**

Managing the operations of a bookstore can be challenging, especially for chain stores handling large inventories and multiple locations. To address these challenges, our group has developed a Bookstore Management System to help streamline the operations of a local bookstore chain.

The system was designed to efficiently manage inventory, sales, discounts, author collaborations, and employee roles, ensuring smooth day-to-day operations.

1. **Entities and Their Functions**

- Publishers: Represents the entities providing books to the bookstore.  
- Titles (Books): Books sourced from specific publishers.  
- Authors: Represents the writers of the books; books can have multiple authors.  
- TitleAuthor: Junction table for many-to-many relationships between authors and titles.  
- Stores: Represents individual stores where books are sold.  
- Sales: Tracks sales transactions.  
- Discounts: Stores promotional discounts on book titles.  
- Jobs: Defines employee roles in the bookstore.  
- Employees: Represents employees and their store assignments.

1. **ER model of the system:**
2. **Relational model (moving from ER model):**

The database is normalized to the Third Normal Form (3NF) to ensure no redundancy and data integrity.   
Functional dependencies between attributes are identified, and all relations are structured to eliminate partial and transitive dependencies.

1. **Data requirements specification (data dictionary) and List of data constrain:**

**Publishers**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data Element** | **Description** | **Data Type** | **Length** | **Value** |
| |  | | --- | | pub\_id |  |  | | --- | |  | | |  | | --- | | The publisher identifier (PK) |  |  | | --- | |  | | |  | | --- | | INT |  |  | | --- | |  | | - | |  | | --- | | NOT NULL, UNIQUE |  |  | | --- | |  | |
| |  | | --- | | pub\_name |  |  | | --- | |  | | |  | | --- | | The name of the publisher |  |  | | --- | |  | | |  | | --- | | NVARCHAR |  |  | | --- | |  | | 100 | NOT NULL |

**Authors**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data Element** | **Description** | **Data Type** | **Length** | **Value** |
| |  | | --- | | au\_id |  |  | | --- | |  | | |  | | --- | | The author identifier (PK) |  |  | | --- | |  | | |  | | --- | | INT |  |  | | --- | |  | | - | NOT NULL  UNIQUE |
| |  | | --- | | au\_name |  |  | | --- | |  | | |  | | --- | | The name of the author |  |  | | --- | |  | | NVARCHAR | 100 | NOT NULL |

**TitleAuthor**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data Element** | **Description** | **Data Type** | **Length** | **Value** |
| |  | | --- | | au\_id |  |  | | --- | |  | | |  | | --- | | The author identifier (FK) |  |  | | --- | |  | | INT | - | |  | | --- | | FOREIGN KEY, NOT NULL |  |  | | --- | |  | |
| |  | | --- | | title\_id |  |  | | --- | |  | | |  | | --- | | The book identifier (FK) |  |  | | --- | |  | | INT | - | |  | | --- | | FOREIGN KEY, NOT NULL |  |  | | --- | |  | |
| |  | | --- | | Primary Key |  |  | | --- | |  | | |  | | --- | | Composite key of au\_id and title\_id |  |  | | --- | |  | |  | - |  |

**Titles (Books)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data Element** | **Description** | **Data Type** | **Length** | **Value** |
| |  | | --- | | title\_id |  |  | | --- | |  | | |  | | --- | | The book identifier (PK) |  |  | | --- | |  | | VARCHAR | - | NOT NULL  UNIQUE |
| |  | | --- | | title\_name |  |  | | --- | |  | | |  | | --- | | The name of the book |  |  | | --- | |  | | NVARCHAR | 200 | |  | | --- | | NOT NULL |  |  | | --- | |  | |
| |  | | --- | | pub\_id |  |  | | --- | |  | | |  | | --- | | The associated publisher (FK) |  |  | | --- | |  | | INT | - | |  | | --- | | FOREIGN KEY, NOT NULL | |

**Stores**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data Element** | **Description** | **Data Type** | **Length** | **Value** |
| |  | | --- | | stor\_id |  |  | | --- | |  |      |  | | --- | |  | | |  | | --- | | The store identifier (PK) |  |  | | --- | |  | | INT | - | NOT NULL  UNIQUE |
| |  | | --- | | stor\_name |  |  | | --- | |  | | |  | | --- | | The name of the store |  |  | | --- | |  | | |  | | --- | | NVARCHAR |  |  | | --- | |  | | |  | | --- | | 100 |  |  |  | | --- | --- | |  |  | | NOT NULL |

**Sales**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data Element** | **Description** | **Data Type** | **Length** | **Value** |
| |  | | --- | | sale\_id |  |  | | --- | |  | | |  | | --- | | The sale transaction identifier (PK) |  |  | | --- | |  | | INT | - | |  | | --- | | NOT NULL, UNIQUE |  |  | | --- | |  | |
| |  | | --- | | stor\_id |  |  | | --- | |  | | |  | | --- | | The store where the sale occurred (FK) |  |  | | --- | |  | | INT | - | |  | | --- | | FOREIGN KEY, NOT NULL |  |  | | --- | |  | |
| |  | | --- | | title\_id |  |  | | --- | |  | | |  | | --- | | The book sold (FK) |  |  | | --- | |  | | INT | - | |  | | --- | | FOREIGN KEY, NOT NULL |  |  | | --- | |  | |
| sale\_date | |  | | --- | | DATE |  |  | | --- | |  | |  | - | |  | | --- | | NOT NULL |  |  | | --- | |  | |
| |  | | --- | | quantity\_sold |  |  | | --- | |  | | |  |  |  | | --- | --- | --- | | |  | | --- | | INT |  |  | | --- | |  | |  |  | | --- | |  | |  | - | NOT NULL,  CHECK > 0 |

**Discounts**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data Element** | **Description** | **Data Type** | **Length** | **Value** |
| discount\_id | The discount identifier (PK) | INT | - | NOT NULL, UNIQUE |
| stor\_id | The store offering the discount (FK) | INT | - | FOREIGN KEY, NOT NULL |
| discount\_value | The value of the discount | DECIMAL | 5, 2 | NOT NULL, CHECK > 0 |

**Jobs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data Element** | **Description** | **Data Type** | **Length** | **Value** |
| job\_id | The job role identifier (PK) | INT | - | NOT NULL, UNIQUE |
| job\_title | The title of the job role | NVARCHAR | 100 | NOT NULL |

**Employee**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data Element** | **Description** | **Data Type** | **Length** | **Value** |
| emp\_id | The employee identifier (PK) | INT | - | NOT NULL, UNIQUE |
| emp\_name | The name of the employee | NVARCHAR | 100 | NOT NULL |
| emp\_phone | The employee's phone number | VARCHAR | 10 | NOT NULL, UNIQUE |
| emp\_address | The address of the employee | NVARCHAR | 200 | CAN NULL |
| job\_id | The job role of the employee (FK) | INT | - | FOREIGN KEY, NOT NULL |
| stor\_id | The store the employee works at (FK) | INT | - | FOREIGN KEY, NOT NULL |

**4. SQL Implementation**

The database was created using SQL Server with the following components:

**4.1 Alter Table Constraints**

- Sales Table: The quantity\_sold column ensures positive values.  
- Discounts Table: The discount\_value column is restricted to positive numbers.  
- Employee Table: A UNIQUE constraint on emp\_phone to prevent duplicates and a check for 10-digit phone numbers.

**4.2 Data Insertion**

At least five records were inserted for each table to test the database functionality.

**4.3 Queries**

The following types of queries were implemented:  
a. Inner Join  
b. Outer Join  
c. Subquery in WHERE clause  
d. Subquery in FROM clause  
e. Group By with aggregate functions

**4.4 Transactions, Triggers, and Procedures**

- A sample transaction was implemented with rollback functionality.  
- A trigger was set up to enforce specific business rules upon data modification.  
- Stored procedures were created to automate common database operations.

**5. Conclusion**

The Bookstore Management System efficiently manages core bookstore operations.   
This project demonstrates the practical application of database design, normalization, and SQL implementation.

**VII. Conclusion**

**● Achievements:**

* Successful collaboration and effective teamwork among all members.
* Application of theoretical knowledge into practical implementation of a database system.
* Establishment of a solid foundation for future projects, including potential enhancements to the Bookstore Management System.
* Significant growth in professional skills, particularly in database design and SQL programming.

**● Areas for Improvement:**

* Some planned features were not fully implemented due to time constraints.
* Further optimization and testing are required to ensure system scalability.

Despite the challenges faced during the development process, this report acknowledges the project's limitations and highlights the areas where improvements can be made. We look forward to incorporating feedback to refine and enhance our system. The team is optimistic that this project can evolve into a more comprehensive and fully operational solution in the near future.