Experion ILP-Batch 1

Task 2

Case Study

Details:

Objective: Design a comprehensive database with well-normalized tables for a real-time domain of your choice. This case study will allow you to apply your knowledge of normalization concepts and database design principles in a practical setting.

Selected Domain: HR - Employee Leave Management System

Employee Leave Management System involves the management and tracking of employee leave requests within an organizational context. This system is designed to streamline and automate the process of requesting, approving, and tracking various types of leaves that employees may take during their tenure with a company.

The Employee Leave Management System holds significant relevance within a company as it plays a pivotal role in streamlining and organizing the crucial aspect of employee time off. Efficient leave management is essential for maintaining a balanced and productive workforce, ensuring that employees can take the necessary breaks without disrupting operations.

This system provides insights into an employee's leave history, offering a clear overview of the number of leaves taken to date and the remaining leave balance.

Tables:

1. **Employee Information Table (EmployeeInfo):**
   - EmployeeID (Primary Key)
   - FirstName
   - LastName
   - Gender
   - DoB
   - Department
   - Position
   - Phone
   - Email
2. **Leave Types Table (LeaveTypes):**
   - LeaveTypeID (Primary Key)
   - LeaveTypeName
   - MaximumDaysAllowed

3. **Leave Requests Table (LeaveRequests):**
   - RequestID (Primary Key)
   - EmployeeID (Foreign Key referencing EmployeeInfo)
   - LeaveTypeID (Foreign Key referencing LeaveTypes)
   - StartDate
   - EndDate
   - RequestDate
   - Status (Pending/Approved/Rejected)
4. **Leave Balances Table (LeaveBalances):**
   - EmployeeID (Foreign Key referencing EmployeeInfo, also part of the composite primary key)
   - LeaveTypeID (Foreign Key referencing LeaveTypes, also part of the composite primary key)
   - LeaveBalance
5. **Login Table (Login):**
   - UserID: A unique identifier for each login record.
   - Username: The username used for login.
   - Password: The hashed password for security.
6. **UserLoginMap Table (UserLoginMap):**
   - UserID (Foreign Key referencing Login): A unique identifier for each login record, acting as a foreign key referencing the UserID in the Login table.
   - EmployeeID (Foreign Key referencing EmployeeInfo, also part of the composite primary key): A unique identifier for each employee, acting as a foreign key referencing the EmployeeID in the EmployeeInfo table. It is also part of the composite primary key.

The '**EmployeeInfo**' table stores basic information about employees.

The '**LeaveTypes**' table holds information about the various types of leave available and their maximum limits.

The '**LeaveRequests**' table tracks leave requests made by employees, including the request status.

The '**LeaveBalances**' table stores the current leave balances for each employee and leave type.

The '**Login'** table is responsible for storing user login credentials.

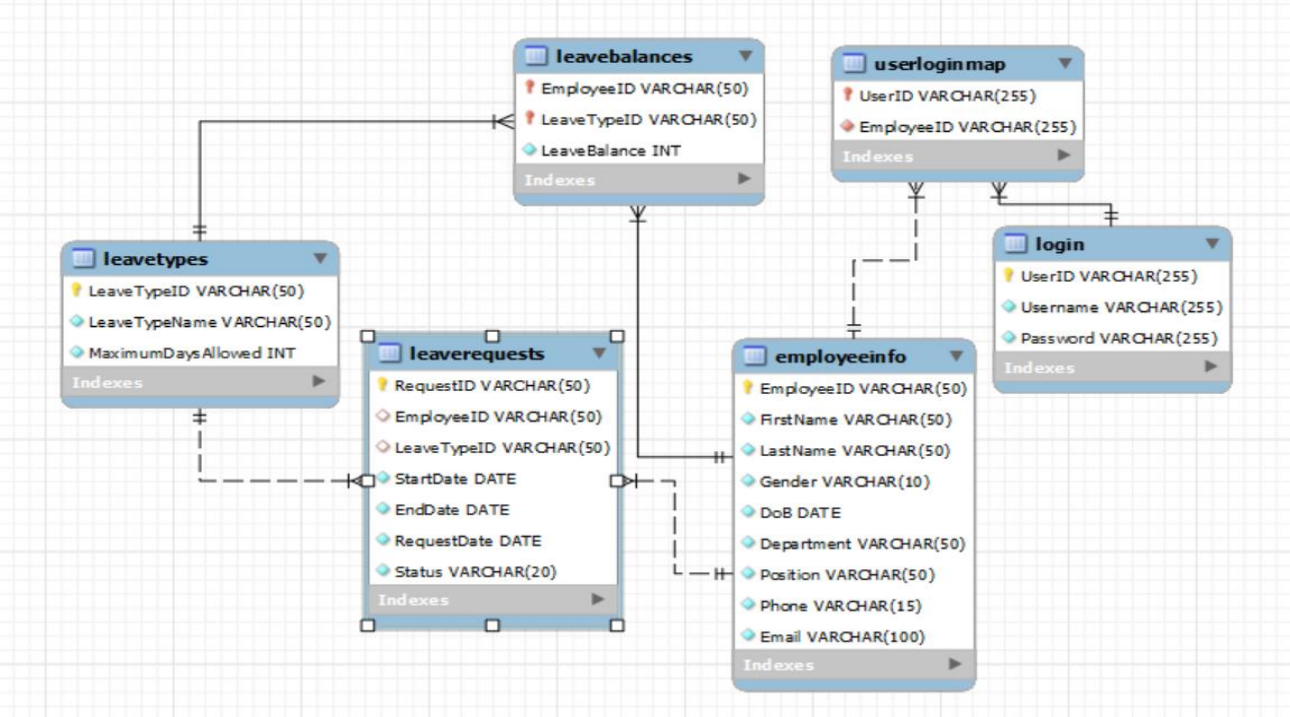
Relationships between tables:

1. EmployeeInfo - LeaveRequests (One-to-Many Relationship):
   - An employee can make multiple leave requests (One employee to Many leave requests).
2. LeaveTypes - LeaveRequests (Many-to-One Relationship):
   - Each leave request is associated with a leave type (Many leave requests to One leave type).
3. EmployeeInfo - LeaveBalances (One-to-One Relationship):

- Each employee has a specific leave balance for each leave type (One employee to One leave balance per type).

4. LeaveTypes - LeaveBalances (One-to-Many Relationship):
   - Each leave type can be associated with multiple leave balances (One leave type to Many leave balances).
5. Login - UserLoginMap - EmployeeInfo (One-to-One Relationship):
   - Each login record in the Login table is associated with exactly one record in the UserLoginMap table.
6. Login - UserLoginMap (One-to-One Relationship):
   - Each login record in the Login table is associated with exactly one record in the UserLoginMap table (One login to One user mapping).

Entity Relationship Diagram:



Details about each table:

1. **Employee Information Table (EmployeeInfo):**
   - EmployeeID
     - Datatype: VARCHAR
     - Description: It is the unique identifier for all employees.
     - Constraints: Primary Key, Not Null
   - FirstName
     - Datatype: VARCHAR
     - Description: It stores the first name of employees.

    - Constraints: Not Null
- LastName
    - Datatype: VARCHAR
    - Description: It stores the last name of employees.
    - Constraints: Not Null
- Gender
    - Datatype: VARCHAR
    - Description: It stores the gender of employees.
    - Constraints: Not Null
- DoB
    - Datatype: Date
    - Description: It stores the date of birth of employees.
    - Constraints: Not Null
- Department
    - Datatype: VARCHAR
    - Description: It stores the department of employees.
    - Constraints: Not Null
- Position
    - Datatype: VARCHAR
    - Description: It stores the job position of employees.
    - Constraints: Not Null
- Phone
    - Datatype: VARCHAR
    - Description: It stores the phone numbers of employees.
    - Constraints: Unique, Not Null
- Email
    - Datatype: VARCHAR
    - Description: It stores the email address of employees.
    - Constraints: Unique, Not Null

2. **Leave Types Table (LeaveTypes):**
- LeaveTypeID
    - Datatype: VARCHAR
    - Description: It stores the unique identifier for each leave type.
    - Constraints: Primary Key, Not Null
- LeaveTypeName
    - Datatype: VARCHAR
    - Description: It stores the name of each leave type.
    - Constraints: Not Null
- MaximumDaysAllowed
    - Datatype: Integer

    - Description: It stores the name of each leave type.
    - Constraints: Not Null, Non-negative

3. **Leave Requests Table (LeaveRequests):**
   - RequestID
     - Datatype: VARCHAR
     - Description: It stores the unique identifier for each Leave Request.
     - Constraints: Primary Key, Not Null
   - EmployeeID
     - Datatype: VARCHAR
     - Description: Foreign key referencing the EmployeeInfo table.
     - Constraints: Foreign Key referencing EmployeeInfo.EmployeeID, Not Null
   - LeaveTypeID
     - Datatype: VARCHAR
     - Description: Foreign Key referencing LeaveTypes.
     - Constraints: Foreign Key referencing LeaveType.LeaveTypeID, Not Null
   - StartDate
     - Datatype: Date
     - Description: Start date of leave request.
     - Constraints: Not Null
   - EndDate
     - Datatype: Date
     - Description: End date of leave request.
     - Constraints: Not Null
   - RequestDate
     - Datatype: Date
     - Description: Date when leave request was made.
     - Constraints: Not Null
   - Status
     - Datatype: VARCHAR
     - Description: Current status of the leave request (Pending, Approved, Rejected).
     - Constraints: Not Null
4. **Leave Balances Table (LeaveBalances):**
   - EmployeeID
     - Datatype: VARCHAR
     - Description: Composite primary key and foreign key referencing the EmployeeInfo table.
     - Constraints: Primary Key, Foreign Key referencing EmployeeInfo.EmployeeID, Not Null
   - LeaveTypeID
     - Datatype: VARCHAR
     - Description: Composite primary key and foreign key referencing the LeaveTypes table.

    - Constraints: Primary Key, Foreign Key referencing LeaveTypes.LeaveTypeID, Not Null
- LeaveBalance
    - Datatype: Integer
    - Description: Remaining balance of leave days for a specific leave type for a specific employee.
    - Constraints: Not Null, Non-negative

5. **UserLoginMap Table (UserLoginMap):**
    - UserID
        - Datatype: VARCHAR
        - Description: It stores the unique identifier for each user login mapping.
        - Constraints: Primary Key, Not Null
    - EmployeeID
        - Datatype: VARCHAR
        - Description: It stores the unique identifier for each employee associated with a user login.
        - Constraints: Not Null, Foreign Key referencing EmployeeInfo
6. **Login Table (Login):**
    - UserID
        - Datatype: VARCHAR
        - Description: It stores the unique identifier for each login record.
        - Constraints: Primary Key, Not Null
    - **Username**
        - Datatype: VARCHAR
        - Description: It stores the username used for login.
        - Constraints: Not Null
    - **Password**
        - Datatype: VARCHAR
        - Description: It stores the hashed password for security.
        - Constraints: Not Null

Normalization

1. EmployeeInfo Table:

EmployeeID	FirstName	LastName	Gender	DoB	Department	Position	Phone	Email
E-1	John	Doe	M	1990-05-15	IT	Developer	123-456-7890	john.doe@email.com
E-2	Jane	Smith	F	1985-08-22	HR	Manager	987-654-3210	jane.smith@email.com
E-3	Mark	Johnson	M	1992-03-10	Finance	Analyst	555-123-4567	mark.johnson@email.com

E-4	Emily	Davis	F	1988-11-30	Marketing	Designer	111-222-3333	emily.davis@email.com
E-5	Michael	Lee	M	1995-07-18	IT	Manager	777-888-9999	michael.lee@email.co

1NF:

The table is already in 1NF.

2NF:

The Department column is partially dependent on the EmployeeID. So, inorder to solve that a department table has been created.

Department Table:

DeptID	Department
D-1	IT
D-2	HR
D-3	Finance
D-4	Marketing
D-5	IT

Updated EmployeeInfo Table:

EmployeeID	FirstName	LastName	Gender	DoB	DeptID	Position	Phone	Email
E-1	John	Doe	M	1990-05-15	D-1	Developer	123-456-7890	john.doe@email.com
E-2	Jane	Smith	F	1985-08-22	D-2	Manager	987-654-3210	jane.smith@email.com
E-3	Mark	Johnson	M	1992-03-10	D-3	Analyst	555-123-4567	mark.johnson@email.com
E-4	Emily	Davis	F	1988-11-30	D-4	Designer	111-222-3333	emily.davis@email.com
E-5	Michael	Lee	M	1995-07-18	D-5	Manager	777-888-9999	michael.lee@email.co

3NF:

The table is now in 3NF as there is no transitive dependency.

2. Leave Types Table

LeaveTypeID	LeaveTypeName	MaximumDaysAllowed

LT-1	Vacation	12
LT-2	Sick Leave	10
LT-3	Personal Leave	7
LT-4	Bereavement Leave	5
LT-5	Maternity Leave	20

1NF:

The table is already in 1NF.

2NF:

The table is already in 2NF.

3NF:

The table is already in 3NF.

3. Leave Requests Table

RequestID	EmployeeID	LeaveTypeID	StartDate	EndDate	RequestDate	Status
RQ-1	E-1	LT-1	15-12-2023	18-12-2023	10-12-2023	Approved
RQ-2	E-3	LT-3	01-12-2023	05-12-2023	05-10-2023	Pending
RQ-3	E-5	LT-4	05-01-2024	07-01-2024	14-12-2023	Rejected
RQ-4	E-3	LT-2	12-12-2023	12-12-2023	12-12-2023	Approved
RQ-5	E-2	LT-1	15-12-2023	16-12-2023	04-12-2023	Approved

1NF:

The table is already in 1NF.

2NF:

The table is already in 2NF as there is no partial dependency present.

3NF:

The Status column depends on the StartDate and EndDate, and they both depend on RequestID thus creating a transitive dependency. So, to solve that we can create another table which is about leave status:

LeaveStatus table:

RequestID	Status
RQ-1	Approved
RQ-2	Pending
RQ-3	Rejected
RQ-4	Approved
RQ-5	Approved

Updating the LeaveRequests table:

RequestID	EmployeeID	LeaveTypeID	StartDate	EndDate	RequestDate
RQ-1	E-1	LT-1	15-12-2023	18-12-2023	10-12-2023
RQ-2	E-3	LT-3	01-12-2023	05-12-2023	05-10-2023
RQ-3	E-5	LT-4	05-01-2024	07-01-2024	14-12-2023
RQ-4	E-3	LT-2	12-12-2023	12-12-2023	12-12-2023
RQ-5	E-2	LT-1	15-12-2023	16-12-2023	04-12-2023

4. Leave Balances Table

EmployeeID	LeaveTypeID	LeaveBalance
E-1	LT-1	8
E-3	LT-3	2
E-5	LT-4	2
E-3	LT-2	9
E-2	LT-1	10

1NF:

The table is already in 1NF.

2NF:

The table is already in 2NF.

3NF:

The table is already in 3NF.

5. Login Table:

UserID	Username	Password
U-1	john_doe	<encrypted_pwd>
U-2	jane_smith	<encrypted_pwd>
U-3	mark_johnson	<encrypted_pwd>
U-4	emily_davis	<encrypted_pwd>
U-5	michael_lee	<encrypted_pwd>

1NF:

The table is already in 1NF.

2NF:

The table is already in 2NF.

3NF:

The table is already in 3NF.

6. UserLoginMap Table:

UserID	EmployeeID
U-1	E-1
U-2	E-2
U-3	E-3
U-4	E-4
U-5	E-5

1NF:

The table is already in 1NF.

2NF:

The table is already in 2NF.

3NF:

The table is already in 3NF.