LAB REPORT

Lab 6
Entity Relationship (ER) Data Model

CSE 4308
DATABASE MANAGEMENT SYSTEMS LAB

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Tasks:

We are Booked (WB) is the legal depository of all new books and other printed materials in Bangladesh. Previously they stored all their information on paper. Recently they have decided to use a database. They have come up with the following requirements:

- There are many branches of WB in different locations in the country. Each branch has its unique branch ID, location, and year of establishment.
- Every branch is maintained by some employees. During the recruitment process, the National ID (NID), name, blood group, and birth date are stored. WB has three types of employees, namely Admin, Librarian, and Maintenance. Each has a separate base salary and 40% housing allowance based on the base salary.
- The employees work in different shifts in different branches. Each shift starts at a certain time on a specific day of the week. It also has a fixed duration.
- Of course the branches house many books. Each book can be identified by a 13-digit ISBN number. The name, author, genre, and price of the books are also stored. The number of copies of a book for each branch should be also tracked efficiently.
- Each book comes from different publishers. The publishers have their name, city, and establishment year. Note that, the same city will not have more than one publisher with the same name.
- To issue a book from any branch, a user has to create an account, providing their unique username. In addition to that, the user's name, date of birth, hometown, and occupation are also stored.
- When a book is issued by a user, the employee sets the issue date and number of days the user can keep the book. It might happen that sometimes the employee forgets to put the duration. In that case, the book should be returned within 15 days. Additionally, information about the user, book, and employee involved needs to be tracked for future purposes.

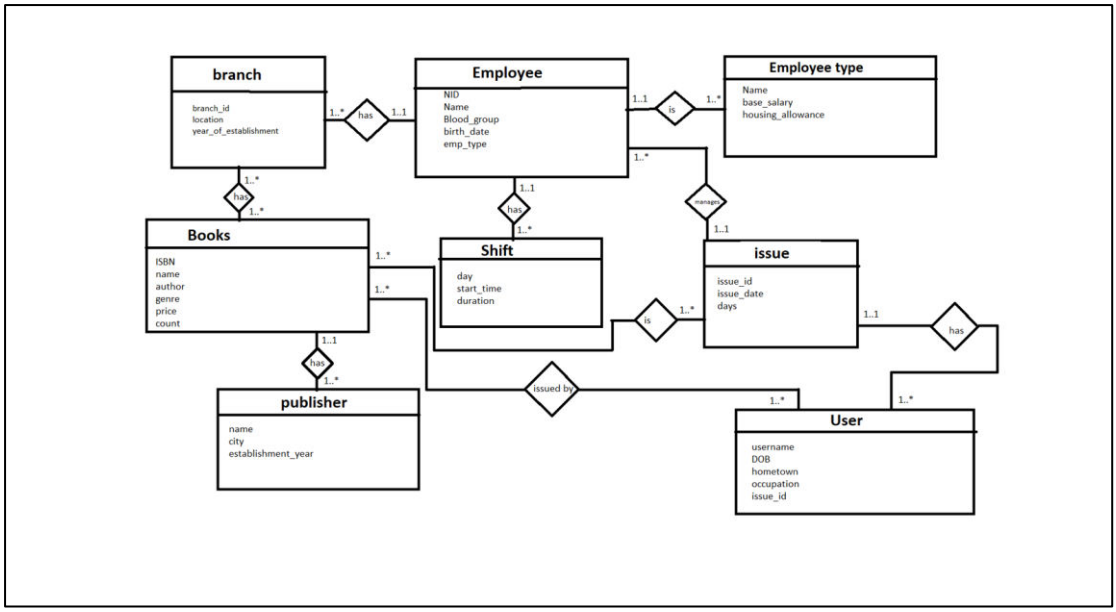
Now, your task is to:

1. Draw an ER Diagram, without any data redundancy, specifying the cardinality explicitly. You may add additional attributes only if it is needed.
2. Convert the ER Diagram into DDL using standard SQL denoting the appropriate constraints.

Analysis of the problem:

A scenario is given from where we need to draw the ER diagram and from that ER diagram we need to execute the corresponding DML operations.

Solution:


branch
branch_id
location
year_of_establishment
1..*
has
1..1
Employee
NID
Name
Blood_group
birth_date
emp_type
1..1
is
1..*
Employee type
Name
base_salary
housing_allowance
1..*
has
1..*
1..1
has
1..*
manages
1..1
Books
ISBN
name
author
genre
price
count
1..*
1..*
Shift
day
start_time
duration
issue
issue_id
issue_date
days
1..1
has
1..1
has
1..*
is
1..*
1..1
has
1..*
publisher
name
city
establishment_year
issued by
1..*
1..*
User
username
DOB
hometown
occupation
issue_id

```
CREATE TABLE BRANCH
(
    branch_id varchar2(10),
    loc varchar2(15),
    year_of_establishment char(4),
    CONSTRAINT pk_branch_id PRIMARY KEY (branch_id)
);


CREATE TABLE EMPLOYEE_TYPE
(
    name varchar2(10),
    base_salary varchar2(10),
    house_allowance varchar2(10),
    CONSTRAINT pk_employeetype_name PRIMARY KEY (name)
);


CREATE TABLE SHIFT
(
    shift_id varchar2(10),
    day varchar2(10),
    start_time TIMESTAMP,
    duration varchar2(10),
    CONSTRAINT pk_shift PRIMARY KEY (shift_id,day,start_time,duration)
);


CREATE TABLE ISSUE
(
    issue_id varchar2(10),
    issue_date DATE,
    duration INT DEFAULT 15,
    CONSTRAINT pk_issue_id PRIMARY KEY (issue_id)
);


CREATE TABLE USERS
(
    username varchar2(10),
    DOB DATE,
    hometown varchar2(15),
    occupation varchar2(15),
    issue_id varchar2(10),
    CONSTRAINT pk_user_username PRIMARY KEY (username),
    CONSTRAINT fk_issue_id FOREIGN KEY (issue_id) REFERENCES ISSUE(issue_id)
);

CREATE TABLE BOOK
(
    ISBN char(13),
    name varchar2(20),
    author varchar2(20),
    genre varchar2(20),
    price varchar2(15),
    copies INT,
    publisher_id varchar2(10),
    CONSTRAINT pk_book_isbn PRIMARY KEY (ISBN),
    CONSTRAINT fk_book_publisherid FOREIGN KEY (publisher_id) REFERENCES PUBLISHER(publisher_id)
);

ALTER TABLE PUBLISHER ADD publisher_id varchar2(10);
ALTER TABLE BOOK ADD CONSTRAINT fk_book_publisherid FOREIGN KEY (publisher_id) REFERENCES PUBLISHER(publisher_id);

CREATE TABLE BOOK_USERS
(
    ISBN char(13),
    username varchar2(10),
    CONSTRAINT pk_book_users PRIMARY KEY (ISBN,username),
    CONSTRAINT fk_bookusers_isbn FOREIGN KEY (ISBN) REFERENCES BOOK(ISBN),
    CONSTRAINT fk_bookusers_username FOREIGN KEY (username) REFERENCES USERS(username)
);


CREATE TABLE BOOK_BRANCH
(
    ISBN char(13),
    branch_id varchar2(10),
    CONSTRAINT pk_book_branch PRIMARY KEY (ISBN,branch_id),
    CONSTRAINT fk_bookbranch_isbn FOREIGN KEY (ISBN) REFERENCES BOOK(ISBN),
    CONSTRAINT fk_bookusers_branchid FOREIGN KEY (branch_id) REFERENCES BRANCH(branch_id)
);


CREATE TABLE PUBLISHER
(
    publisher_id varchar2(10),
    name varchar2(20),
    city varchar2(20),
    year_of_establishment char(4),
    CONSTRAINT pk_publisher PRIMARY KEY (publisher_id,name,city)
);
```

```
CREATE TABLE EMPLOYEE
(
    NID varchar2(10),
    name varchar2(15),
    blood_group char(2),
    DOB DATE,
    emp_type varchar2(10),
    branch_id varchar2(10),
    shift_id varchar2(10),
    issue_id varchar2(10),
    CONSTRAINT pk_employee_nid PRIMARY KEY (NID),
    CONSTRAINT fk_branch_id FOREIGN KEY (branch_id) REFERENCES BRANCH(branch_id),
    CONSTRAINT fk_employee_emp_type FOREIGN KEY (emp_type) REFERENCES EMPLOYEE_TYPE(name),
    CONSTRAINT fk_shift FOREIGN KEY (shift_id) REFERENCES SHIFT(shift_id),
    CONSTRAINT fk_issue FOREIGN KEY (issue_id) REFERENCES ISSUE(issue_id)
);
```

Interesting Findings:

Easy to execute DML’s after drawing ER diagram.