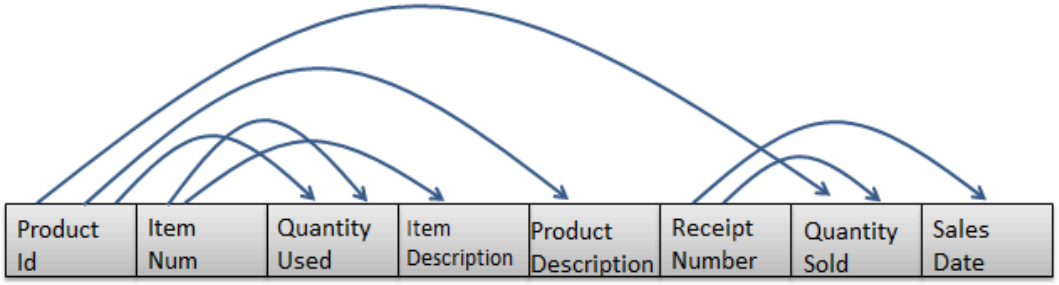
CS443 - Assignment 1

Question #1

Consider the following data. Arrows show the functional dependency.

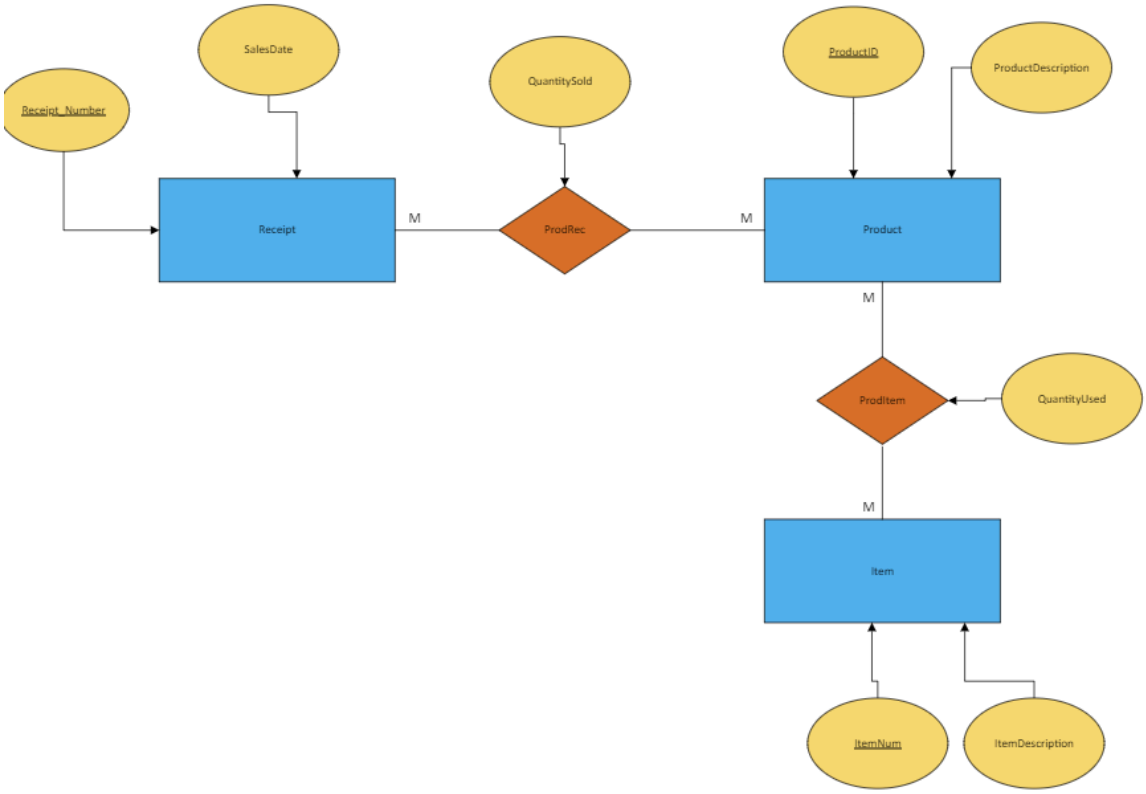


The arrows in this question indicated the determination of two attributes. For example, the arrow that goes ProductID to ProductDescription indicates that ProductID determines the ProductDescription. This in turn means that ProductId can be considered as primary key for ProductDescription.

a) Write the tables.
Product (ProductId, ProductDescription)
Item (ItemNum, ItemDescription)
Receipt (ReciptNum, SalesDate)
ProdItem (ProductId, ItemNum*, QuantityUsed**)**
ProdRec (ProductId, ReciptNum*, QuantitySold**)**

b) Place the tables in 3rd normal form (if necessary)
- The tables have been split into 3rd normal form

c) Create ERD based on the normalized tables



d) Write a script to create a database. Your script should create the tables and ensures that all constraints are set properly.

Here is some information to create your tables

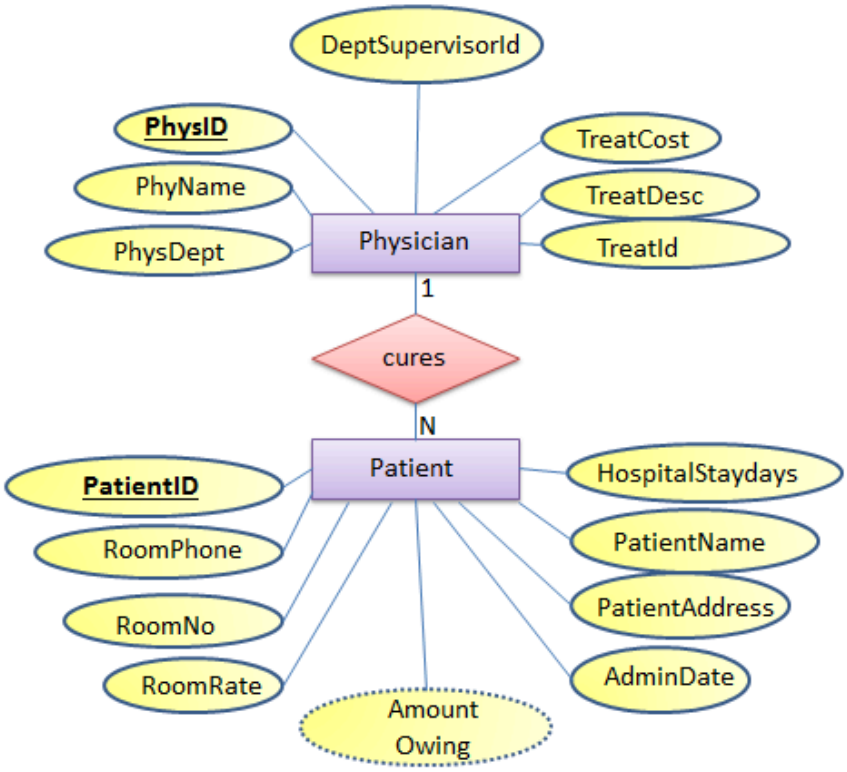
Data Item (Column Name)	Type	Restriction
ProductId	Numeric – Integer	
ItemNum	Numeric – Integer	Not null
QuantityUsed	Numeric – Integer	>= 0
ItemDescription	Character – Up to 200	
ProductDescription	Character – Up to 200	
ReceiptNumber	Numeric – Integer	Not null
QuantitySold	Numeric – Integer	> = 0
SalesDate	Date	

```sql
-- Create the Product table
CREATE TABLE Product (
    ProductId INT PRIMARY KEY,
    ProductDescription VARCHAR(255)
);

-- Create the Item table
CREATE TABLE Item (
    ItemNum INT PRIMARY KEY,
    ItemDescription VARCHAR(255)
);

-- Create the Receipt table
CREATE TABLE Receipt (
    ReceiptNum INT PRIMARY KEY,  -- Correct spelling here
    SalesDate DATE
);

-- Create the ProdItem table (for the relationship between Product and Item)
CREATE TABLE ProdItem (
    ProductId INT,
    ItemNum INT,
    QuantityUsed INT,
    PRIMARY KEY (ProductId, ItemNum),
    FOREIGN KEY (ProductId) REFERENCES Product(ProductId),
    FOREIGN KEY (ItemNum) REFERENCES Item(ItemNum)
);

-- Create the ProdRec table (for the relationship between Product and Receipt)
CREATE TABLE ProdRec (
    ProductId INT,
    ReceiptNum INT,  -- Correct spelling here as well
    QuantitySold INT,
    PRIMARY KEY (ProductId, ReceiptNum),
    FOREIGN KEY (ProductId) REFERENCES Product(ProductId),
    FOREIGN KEY (ReceiptNum) REFERENCES Receipt(ReceiptNum)
);
```

```
Table PRODUCT created.

Table ITEM created.

Table RECEIPT created.

Table PRODITEM created.

Table PRODREC created.
```

Question #2

Consider the following ERD



Where

- PatientId: It is the identification number of each patient
- PatientName: It is the name of the patient
- Patientddr: It is the address of the patient
- AdmitDate: It is the date when the patient is admitted to the hospital
- AmounOwing: The amount the patient owes based on his/her sickness after being discharged
- RoomNo: it is the room where the patient is kept in the hospital
- RoomPhone: The phone number in the patient's room
- HospitalStayDays: Number of days the patient would be in the hospital for treatment.
- RoomRate: The rate charged for every day the patient is in the room

In the second table:

- PhysId: It is the identification number of each physician
- PhyName: It is the name of each physician
- PhysDept: It is the department id where physician works
- DeptSupervisorId: It is the id of the physician who is in change of managing the PhyDept. For example, suppose physician x works in department y. DeptSupervisorId is the id of the physician (not necessarily physician x) who in managing department y.
- TreatId is a number that represents the type of treatment the physician can do
- TreatDesc and TreatCost are Treatment description and treatment cost

- Each patient is assigned one doctor, but a doctor can have many patients

- There may be more than one patient in a room but each patient is kept in one room only
- Each patient is being treated for one sickness only
- There is only one phone number in each room in the hospital

- Each doctor can do only do one treatment, but a treatment can be done by many doctors
- The treatment cost is fixed for each treatment
- Each doctor works in only one department, but a department can have many doctors
- Each department has 1 supervisor. This supervisor is just one of the physicians who works in that department
- A Patient is charged based on the treatment cost and number of days in hospital

Note that not all the rooms in the hospital has patient at a particular time but all patient must be is some rooms. Further, only some of the physicians are supervising the departments in the hospital; however, all departments must be managed by some physicians.

You may make any other assumption you think is necessary but you have to be very specific and realistic. You can add other assumptions but you are not allowed to change the above assumptions

Do the following

a) Change the ERD to tables

Physician (PhysID, PhysName, PhysDept, DeptSupervisorID, TreatCost, TreatDesc,TreatID)
Patient (PatientID, RoomPhone, RoomNo, RoomRate, HospitalStayDay, PatientName, PatientAddress, AdminDate, AmountOwing, PhysID*)

b) Place the tables in 3rd normal form (if necessary)

Physician (PhysID, PhysName, PhysDept*, TreatID*)
Department (PhysDept, DeptSupervisorID*)
Treatment (TreatID,TreatCost,TreatDesc)
Patient (PatientID, PatientName, PatientAddress, AdminDate, HospitalStaydays, RoomNo*, PhysID*)
Room (RoomNo, RoomPhone, RoomRate)

c) Revise the given ERD based on the normalized tables (if necessary)

d) Write a script to create a database. Your script should create the tables and ensures that all constraints are set properly.

Here is some information to create your tables using SQL. Depending on your normalization process, some of the following fields may not be in your final normalized table.

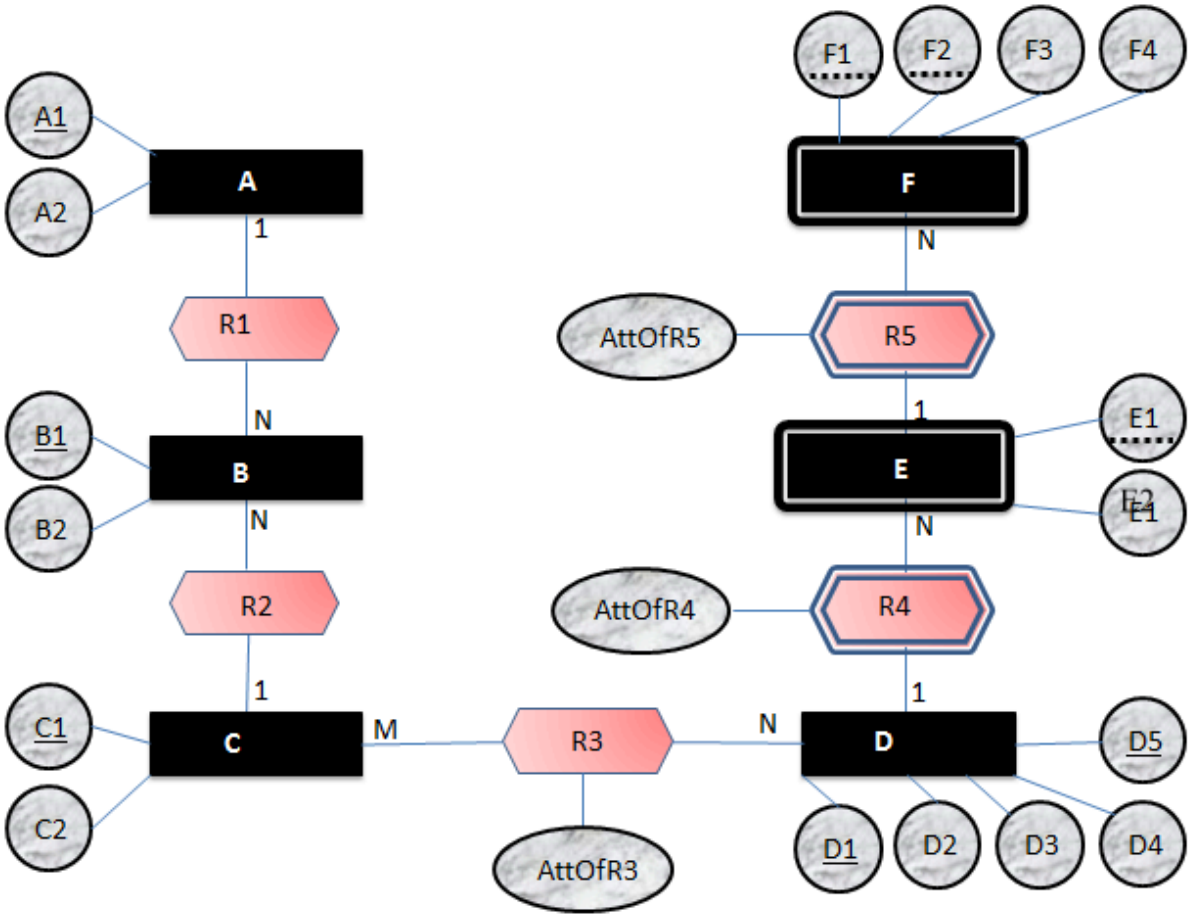
DATA ITEM (COLUMN NAME)	TYPE	RESTRICTIONS
PatientID	Numeric – Integer	
PhysID	Numeric – Integer	
RoomNo	Numeric – Integer	>= 100 and <= 999
AdmitDate	Date	
PatientName	Character -- Up to 50	Not null
PatientAddress	Character -- Up to 200	Not null
RoomPhone	Character -- Up to 8	
HospitalStayDays	Numeric – Integer	>= 0
RoomRate	Numeric – Decimal 10 with 2 decimals	>= 30.00 and < =100.00
AmountOwing	Numeric – Decimal 10 with 2 decimals	
PhysName	Character -- Up to 50	Not null
PhysDept	Numeric – Integer	
DeptSupervisorId	Numeric – Integer	
TreatId	Numeric – Integer	
TreatDesc	Character -- Up to 200	
TreatCost	Numeric – Decimal 10 with 2 decimals	>= 50.00

```sql
-- Create the Treatment table
CREATE TABLE Treatment (
    TreatId INT PRIMARY KEY,
    TreatDesc VARCHAR(200),
    TreatCost DECIMAL(10, 2) CHECK (TreatCost >= 50.00) NOT NULL
);

-- Create the Physician table
CREATE TABLE Physician (
    PhysID INT PRIMARY KEY,
    PhysName VARCHAR(50) NOT NULL,
    PhysDept INT,
    TreatId INT,
    FOREIGN KEY (TreatId) REFERENCES Treatment(TreatId)
);

-- Create the Department table
CREATE TABLE Department (
    PhysDept INT PRIMARY KEY,
    DeptSupervisorID INT,
    FOREIGN KEY (DeptSupervisorID) REFERENCES Physician(PhysID)
);
-- Create the Room table
CREATE TABLE Room (
    RoomNo INT PRIMARY KEY CHECK (RoomNo >= 100 AND RoomNo <= 999),
    RoomPhone VARCHAR(8),
    RoomRate DECIMAL(10, 2) CHECK (RoomRate >= 30.00 AND RoomRate <= 100.00) NOT NULL
);
-- Create the Patient table
CREATE TABLE Patient (
    PatientID INT PRIMARY KEY,
    PatientName VARCHAR(50) NOT NULL,
    PatientAddress VARCHAR(200) NOT NULL,
    AdmitDate DATE NOT NULL,
    HospitalStaydays INT CHECK (HospitalStaydays >= 0) NOT NULL,
    RoomNo INT,
    PhysID INT,
    AmountOwing DECIMAL(10, 2),
    FOREIGN KEY (RoomNo) REFERENCES Room(RoomNo),
    FOREIGN KEY (PhysID) REFERENCES Physician(PhysID)
);
```

```
Table TREATMENT created.


Table PHYSICIAN created.


Table DEPARTMENT created.


Table ROOM created.


Table PATIENT created.
```

Question #3

Create the tables related to the following ERD. Determine the primary Keys and the foreign keys of each table.

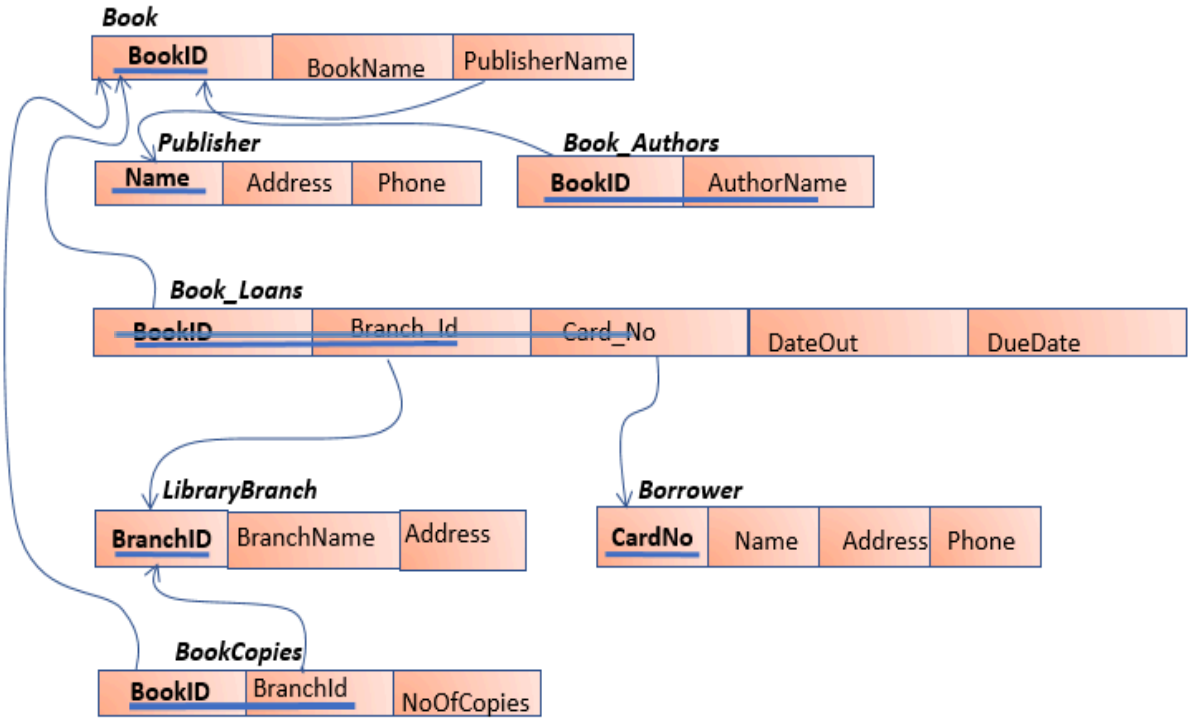


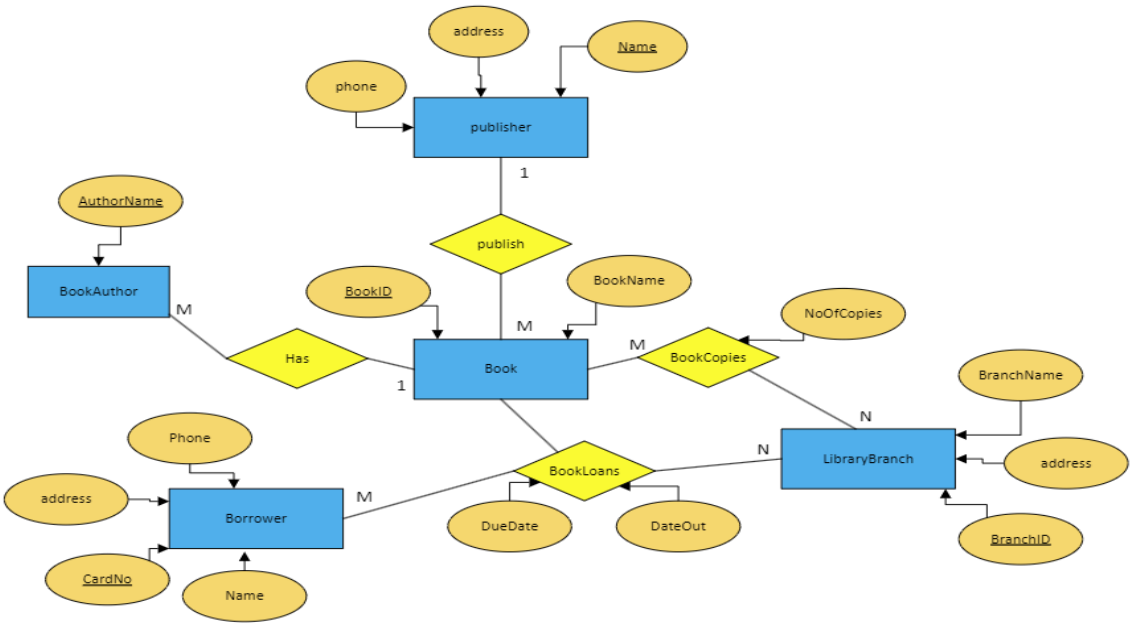
Question #3 Tables

A (A1, A2)
B (B1, B2, A1*, C1*)
C (C1, C2)
R3 (C1*, (D1, D5)*, AttOfR3)
D (D1, D5, D2, D3, D4)
E (E1, E2, (D1, D5)*, AttOfR4)
F (F1, F2, (E1, D1, D5)*, F3, F4, AttOfR5)

Question #4

Create ERD based on the following tables. The underlines attributes are primary keys. The links are connection between primary keys and foreign keys





Question #5

Create ERD based on the following tables. The underlined attributes are primary keys.
The links are connection between primary keys and foreign keys