CS443 - Assignment 1

Question #1

Consider the following data. Arrows show the functional dependency.

Product Id	Item Num	Quantity Used	Item Description	Product Description	Receipt Number	Quantity Sold	Sales Date
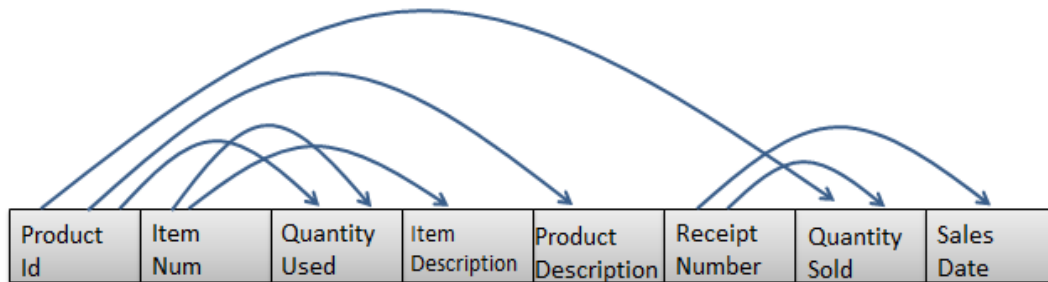
The arrows in this question indicated the determination of two attributes. For example, the arrow that goes ProductID to ProductDescription indicates that ProductID determines the ProductDescription. This in turn means that ProductId can be considered as primary key for ProductDescription.

a) Write the tables
   Product(ProductId, ProductDescription)
   Item(ItemNum ItemDescription, ReceiptNumber*)
   Receipt(ReceiptNumber, SalesDate, ProductId*)
   Sales(QuantitySold, ProductId*)
   Inventory(QuantityUsed, ProductId*)

b) Place the tables in 3rd normal form (if necessary)
c) Create ERD based on the normalized tables
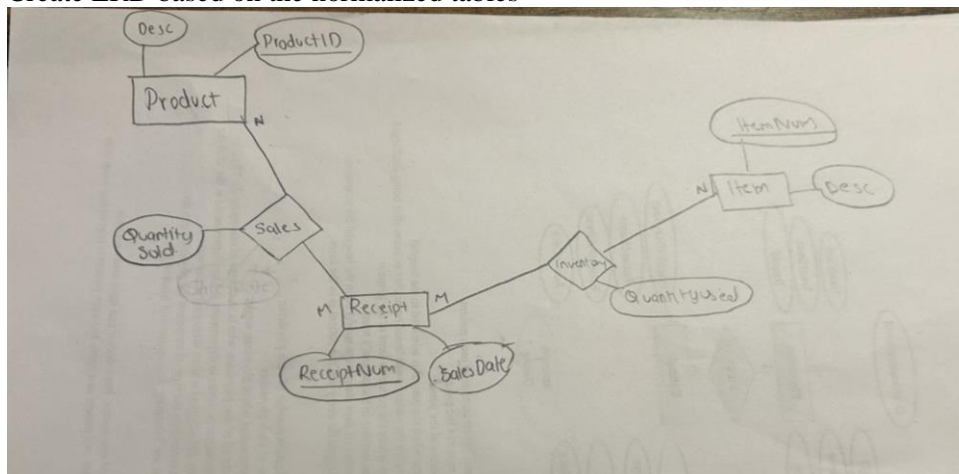
d) Write a script to create a database. Your script should create the tables and ensures that all constraints are set properly.

Here is some information to create your tables
SCRIPT:
```
CREATE TABLE Product (
    ProductId           NUMBER,
    ProductDescription     VARCHAR(200),
    CONSTRAINT Prod_PK     PRIMARY KEY(ProductId)
);

CREATE TABLE Receipt (
    ReceiptNumber           NUMBER,
    SalesDate           DATE,
    ProductId           NUMBER,
    CONSTRAINT RN_CK        NOT NULL,
    CONSTRAINT Receipt_PK   PRIMARY KEY(ReceiptNumber),
    CONSTRAINT FK1          FOREIGN KEY (ProductId) REFERENCES
Product(ProductId)
);

CREATE TABLE Item (
    ItemNum            NUMBER,
    ItemDescription        VARCHAR(200),
    ReceiptNumber          NUMBER,
    CONSTRAINT itemNum_CK   NOT NULL,
    CONSTRAINT Item_PK     PRIMARY KEY(ItemNum),
    CONSTRAINT Item_FK     FOREIGN KEY (ReceiptNumber)
REFERENCES Receipt(ReceiptNumber)
);

CREATE TABLE Sales (
    QuantitySold           NUMBER,
    ProductId           NUMBER,
    CONSTRAINT SALES_FK     FOREIGN KEY (ProductId) REFERENCES
Product(ProductId),
    CONSTRAINT QS_CK        CHECK (QuantitySold >= 0)
);

CREATE TABLE Inventory (
    QuantityUsed          NUMBER,
    ProductId           NUMBER,
    CONSTRAINT QU_CK1       CHECK (QuantityUsed >= 0),
    CONSTRAINT INVEN_FK     FOREIGN KEY (ProductId) REFERENCES
Product(ProductId)
););
```
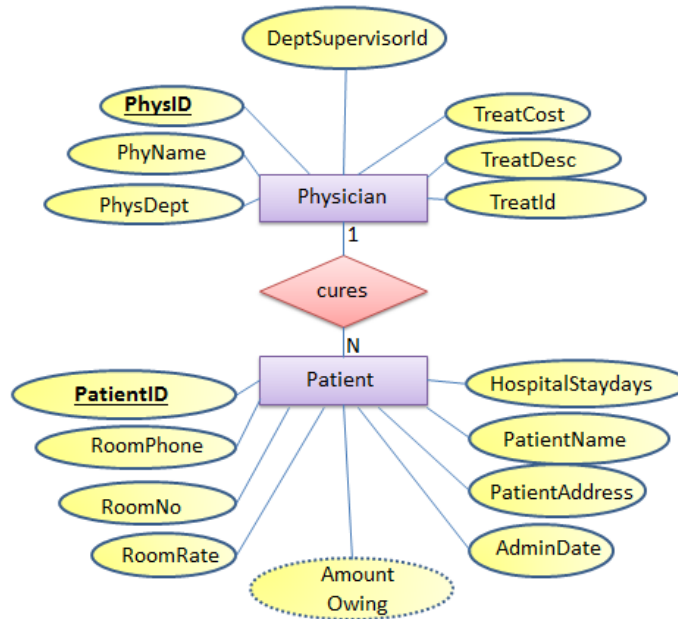
DATA ITEM (COLUMN NAME)	TYPE	RESTRICTION
ProductId	Numeric – Integer	
ItemNum	Numeric – Integer	Not null
QuantityUsed	Numeric – Integer	>= 0

ItemDescription	Character – Up to 200	
ProductDescription	Character – Up to 200	
ReceiptNumber	Numeric – Integer	Not null
QuantitySold	Numeric – Integer	$>=0$
SalesDate	Date	

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
Patient(PatientId, RoomPhone, RoomNo, RoomRate, AmountOwning, AdminDate, PatientAddress, PatientName, HospitalStaydays, PhysId*)
Physician(PhysId, PhyName, PhysDept, DeptSupervisorId, TreatCost, TreatDesc, TreatId)

b) Place the tables in 3rd normal form (if necessary)
Physician(PhysId, PhyName, PhyDept*, DeptSupervisorId, TreatId*)
Patient(PatientId, PatientName, PatientAddress, AdminDate, AmountOwning, HospitalStaydays ,RoomNo*, PhysId*)
Room(RoomNo, RoomPhone, RoomRate)
Treatment(TreatId, TreatCost, TreatDesc ,PhysId*)
Dept(DeptSupervisorId, DeptName, PhysId*)

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

c) Revise the given ERD based on the normalized tables (if necessary)
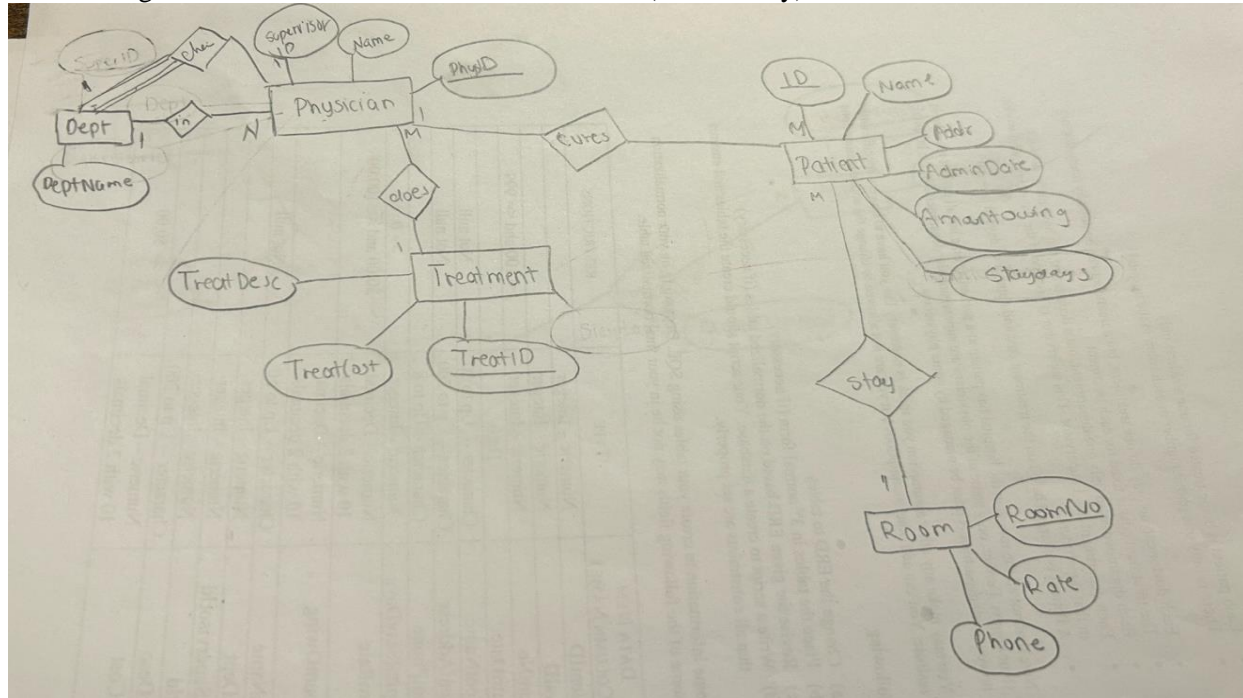
SCRIPT:
CREATE TABLE Dept
(
  PhysDept   NUMBER,
  DeptSupervisorID   NUMBER,
  CONSTRAINT DepT_PK PRIMARY KEY (PhysDept)
);

CREATE TABLE Room
(
  RoomNo   NUMBER,
  RoomPhone NUMBER(8),
  RoomRate   NUMBER(10,2),

```
   CONSTRAINT Room_PK PRIMARY KEY (RoomNo),
   CONSTRAINT Room_cK CHECK (RoomNo >= 100 AND
RoomNo <= 999),
   CONSTRAINT Room_CK2 CHECK (RoomRate >= 30.00 AND
RoomRate <= 100.00)

);
CREATE TABLE Treatment
(
   TreatID          NUMBER,
   TreatCost          NUMBER(10,2),
   TreatDesc          VARCHAR(200),
   CONSTRAINT Treatment_PK PRIMARY KEY (TreatID),
   CONSTRAINT Treatment_CK CHECK (TreatCost >= 50.00)
);

CREATE TABLE Physician
(
   PhysID          NUMBER,
   PhyName          VARCHAR(50),
   PhysDept          NUMBER,
   TreatID        NUMBER,
   CONSTRAINT Physician_PK PRIMARY KEY (PhysID),
   CONSTRAINT PhyName_Null NOT NULL,
   CONSTRAINT Physician_FK FOREIGN KEY (PhysDept)
REFERENCES Department(PhysDept),
   CONSTRAINT Physician_FK1 FOREIGN KEY (TreatID)
REFERENCES Treatment(TreatID)
);


CREATE TABLE Patient
(
   PatientID              NUMBER,
```

```
    AdminDate              DATE,
    PatientAddress         VARCHAR(200),
    PatientName            VARCHAR(50),
    HospitalStayDays    NUMBER,
    PhysID              NUMBER,
    RoomNo              NUMBER,
    CONSTRAINT Address_CK NOT NULL,
    CONSTRAINT Name_CK NOT NULL,
    CONSTRAINT Patient_PK PRIMARY KEY (PatientID),
    CONSTRAINT Patient_FK1 FOREIGN KEY (PhysID)
REFERENCES PhysInfo(PhysID),
    CONSTRAINT Patient_FK2 FOREIGN KEY (RoomNo)
REFERENCES Room(RoomNo)
);
```
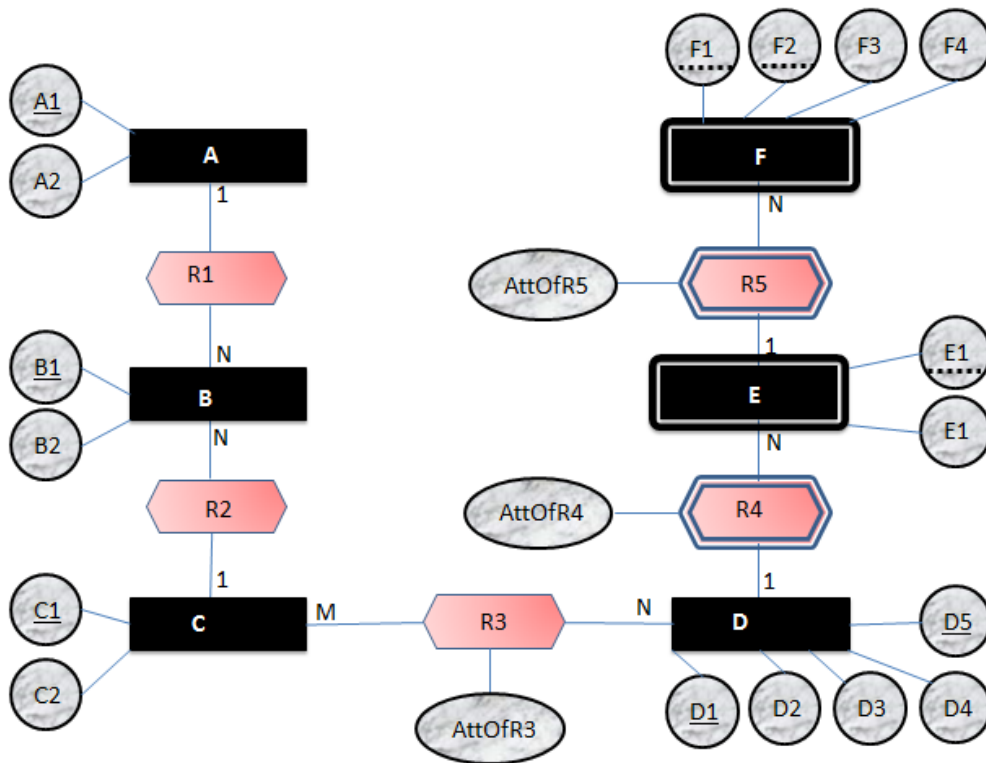
Question #3

Create the tables related to the following ERD. Determine the primary Keys and the foreign keys of each table.
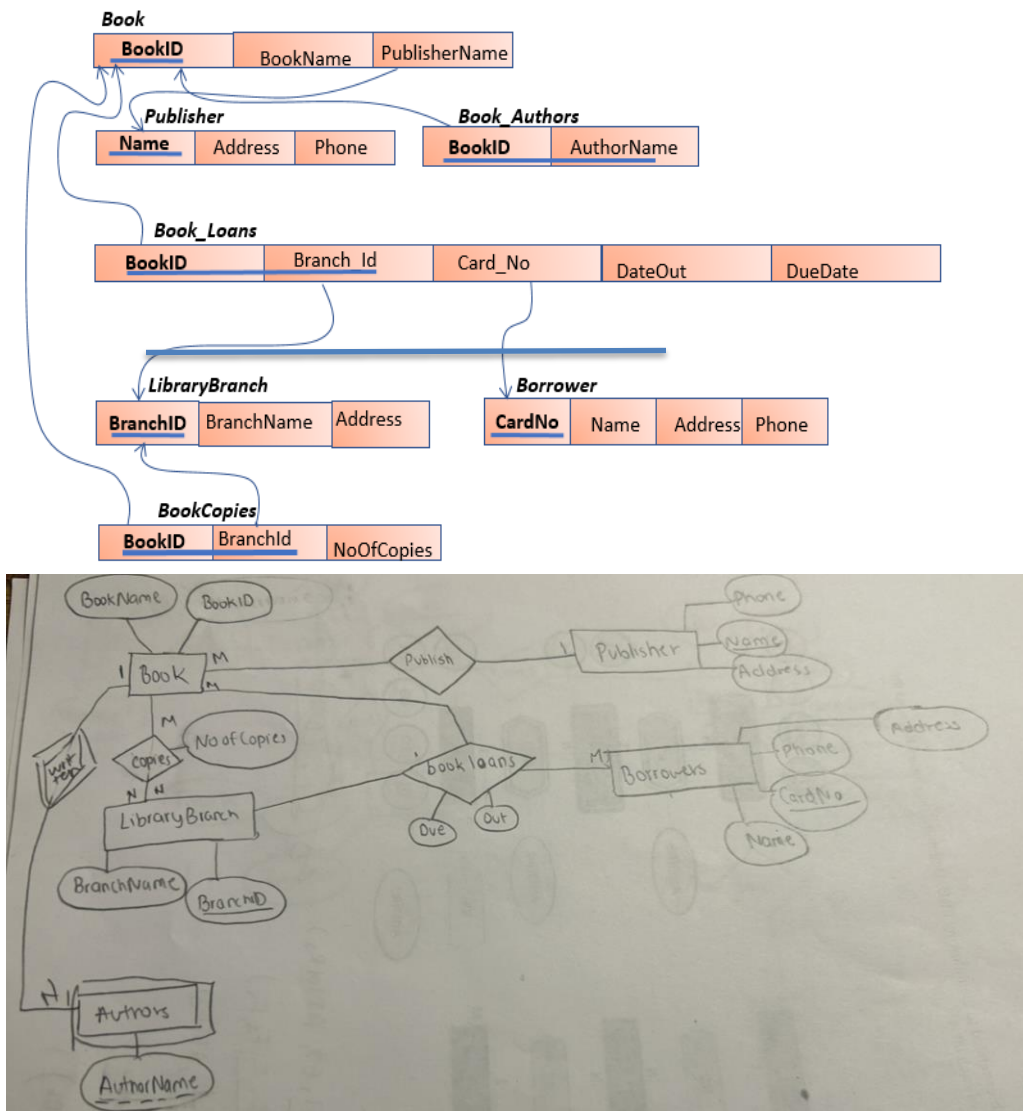
A1
A2
A
1

R1
N
B1
B2
B
N
R2
1
C1
C2
C
M
R3
N
AttOfR3

F1 F2 F3 F4
F
N
AttOfR5
R5
1
E1
E
E1
N
AttOfR4
R4
1
D
1
D5
D1 D2 D3 D4

E2

AttOfR3

A(A1, A2)

$E((0,0_5)^*, E1, E2, ATTofR_2)$

$F(D_1, D_5, EU^*, F_1, F_2, F_3, F_4)$

$R3(C1^*, (C1, D_5)^{+*}, ATTR3)$

C(C1, C2)

$B(B1, B2, A1^*, C1^*)$

$D(D1 D_5, D_2, D_3, D_4)$

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

Book

BookID	BookName	PublisherName

Publisher

Name	Address	Phone

Book_Authors

BookID	AuthorName

Book_Loans

BookID	Branch_Id	Card_No	DateOut	DueDate

LibraryBranch

BranchID	BranchName	Address

Borrower

CardNo	Name	Address	Phone

BookCopies

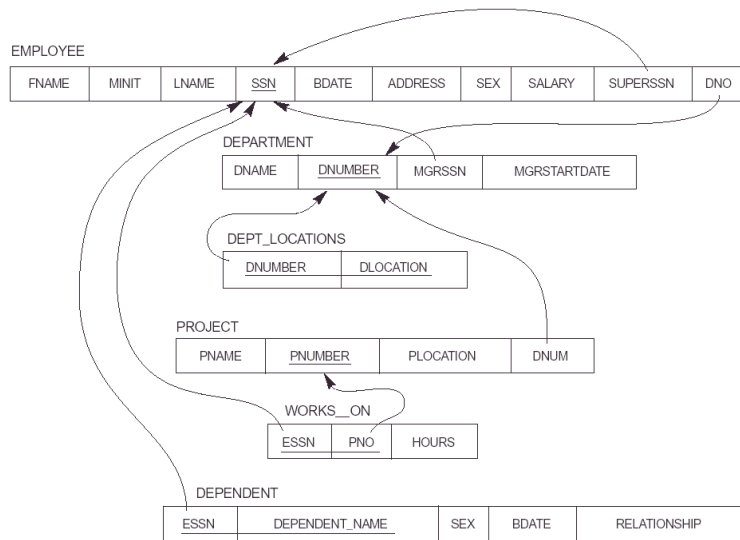| BookID	BranchId	NoOfCopies

Question #5

Create ERD based on the following tables. The underlines attributes are primary keys. The links are connection between primary keys and foreign keys
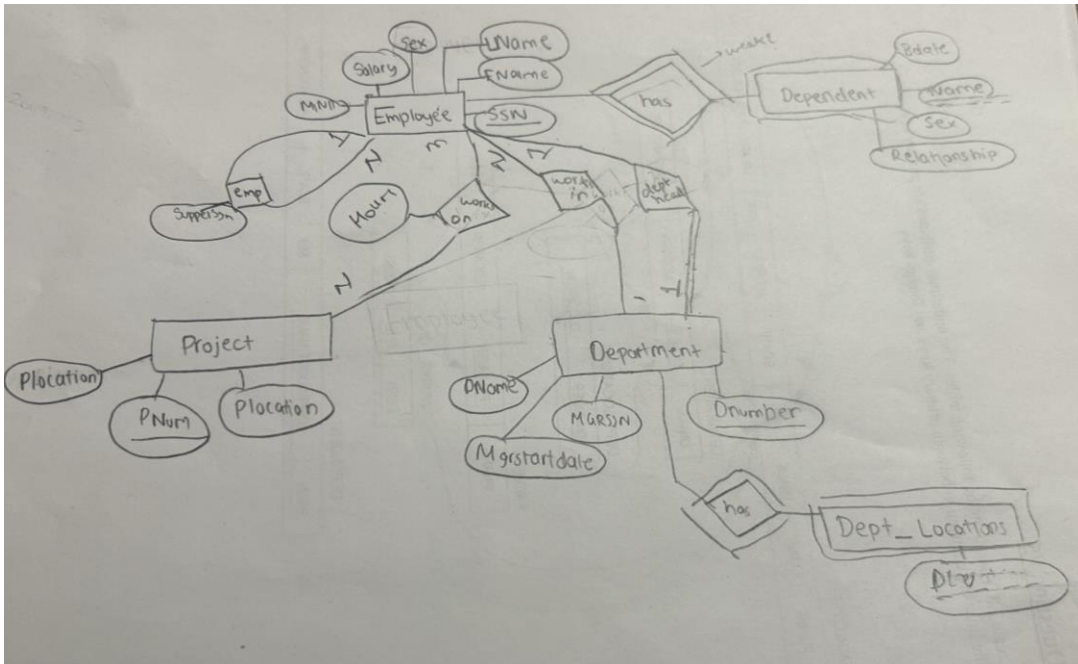
Thank you for all your help in class today Professor Hadaegh!