CS 775/875 **Database Management Systems**

Spring 2021

Assignment #10

Due: Monday, April 26, 11:59 PM.

Submit Instructions: Submit hw10.pdf on MyCourses
Write your answers in order by question number.

Objective: Practice analyzing requirements for database systems and developing conceptual models expressed as Entity-Relationship (ER) schemas

Submission: 1 day late: 2 points off; 2 days late: 4 points off.

Question 1) (15)

The following ER diagram has been created for a database that will store information about motion pictures. The diagram illustrates entities and relationships (with constraints). Attributes are omitted so that we can solely focus on the relationships between the entities.

Using this ER diagram for reference, respond to the following statements:

* Suppose an actor can play a lead role in at most 2 movies, and there are 2 actors:

a) what is the minimum number of movies? 1

b) what is the maximum number of movies? 4

m_1 — a_1 m_2 — a_2 } each movie must have at least 1 lead actor
m_3 — a_1 m_4 — a_2

* Suppose there are 2 movies:

c) what is the minimum number of actors that can play lead roles? 1

d) what is the maximum number of actors that can play lead roles? 4

*Suppose there are 2 movies:

e) what is the minimum number of directors? 1

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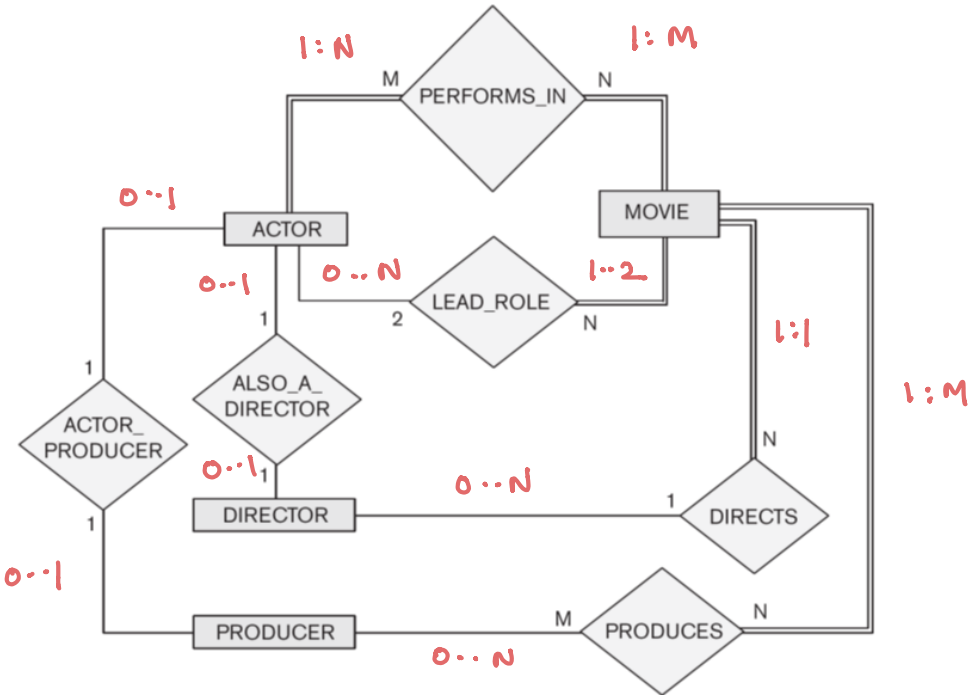
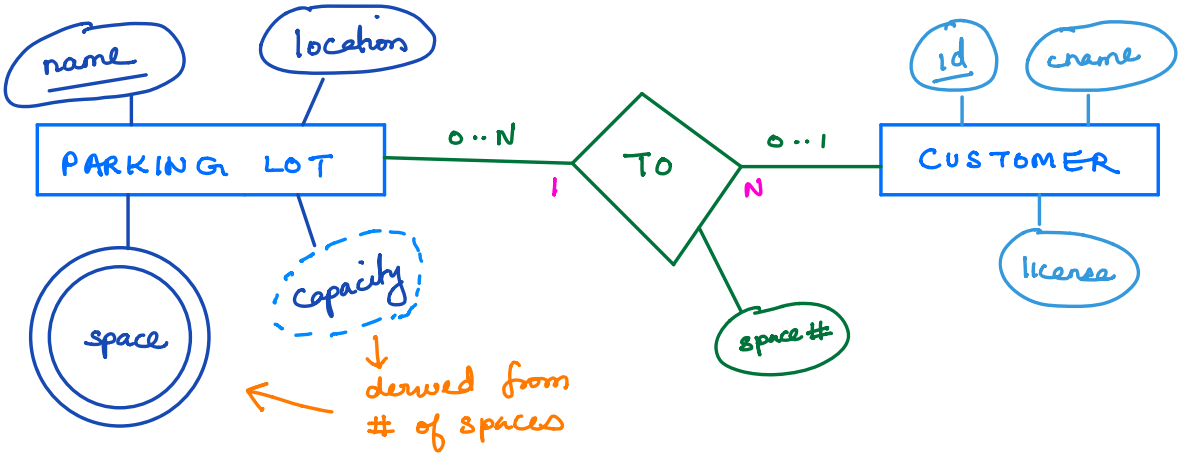
Using this ER diagram for reference, respond to the following statements with TRUE, FALSE, or MAYBE. Assign a response of MAYBE to statements that, while not explicitly shown to be TRUE, cannot be proven FALSE based on the diagram.



STATEMENT	TRUE	FALSE	MAYBE
f) There are actors that have no movies.	___	✓	___
g) Every movie has exactly one director.	✓	___	___
h) An actor may be the lead in at most two movies.	___	✓	___
i)If there are no movies, then there are no directors.	___	✓	___
j) If there are no actors, then there are no movies.	✓	___	___
k) A movie can have at most two lead actors	✓	___	___
l) An actor who is also a director can direct at most one movie.	___	✓	___
m) A movie may have no producers.	___	✓	___
n) There are producers with no movies.	✓	___	___
o) A producer may act in several movies.	✓	___	___

Question 2:



Parking Lot (Name , location)

customer (id , cname, license, name, space#)

1:N

Parking Space (name , space#)

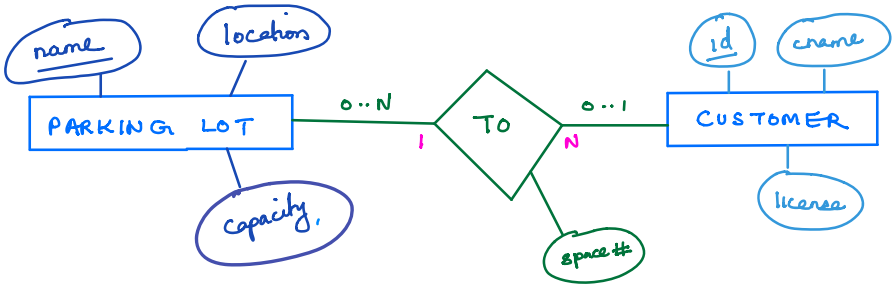
M:N

you need not model space explicitly.

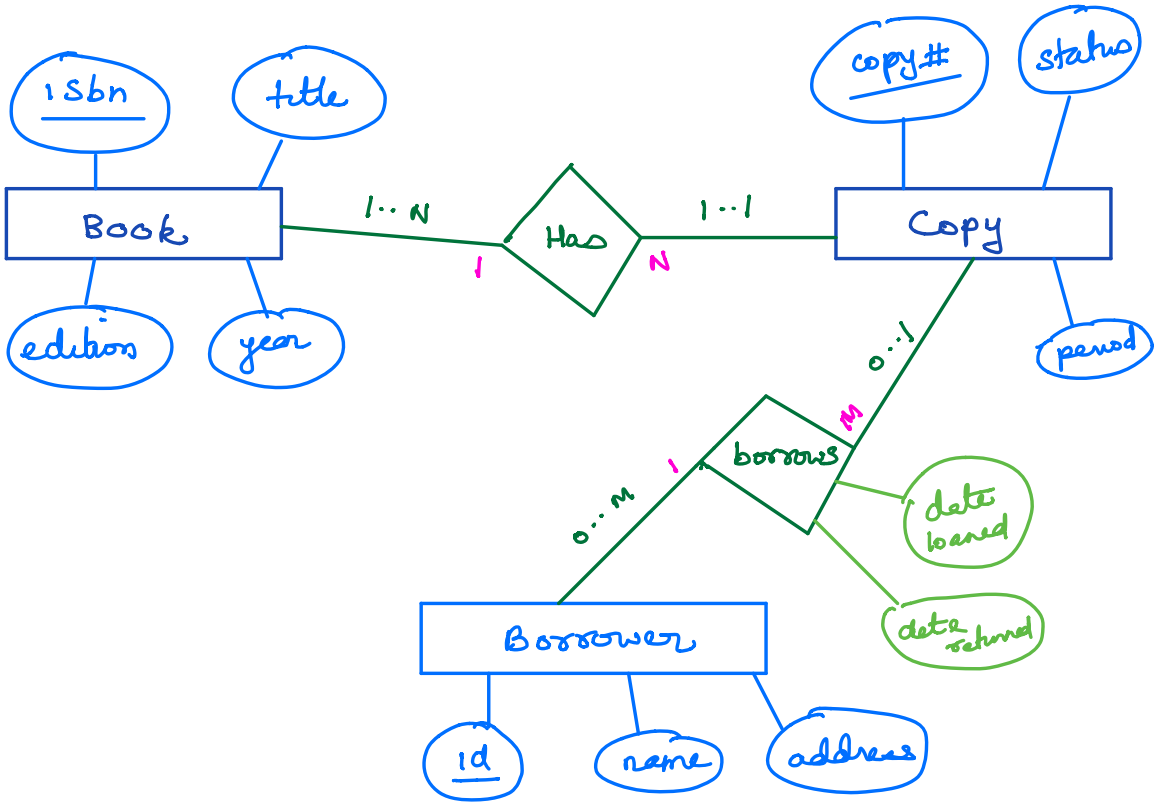
Parking Lot (Name , location, capacity)

customer (id , cname, license, name, space#)

1:N



Question 3



Book (isbn , title, edition, year)

Copy (copy# , status, period, isbn, id, date loaned, date returned)

Borrower (id , name , address)

Question 2) (8)

Create an Entity-Relationship (ER) diagram for a database that stores the following information:

- A large organization has several parking lots, which are used by staff.
- Each parking lot has a unique name (key), location, capacity (number of parking spaces).
- Each parking space in a parking lot is uniquely identified by a number. (A space is uniquely identified by lot name and number.)
- Staff members can request sole use of a single parking space. Each staff member is identified by id, name, vehicle license number.

List the tables (and their attributes) generated from your ER diagram.

Question 3) (8)

Create an Entity-Relationship (ER) diagram for a database that stores library data:

- The library provides books to borrowers.
- Each book is described by isbn (key), title, edition, and year of publication.
- Each borrower is uniquely described by id (key), name, and address.
- The library provides one or more copies of each book and each copy is uniquely identified by a copy number, status indicating book is available for loan, and the allowable loan period for the copy. Each copy is uniquely identified by its copy# (that is, a copy does not need the isbn number for identification).
- A borrower may loan one or more books (copy), and the date each book is loaned out and is returned is recorded. Loan number uniquely identifies each book loan.

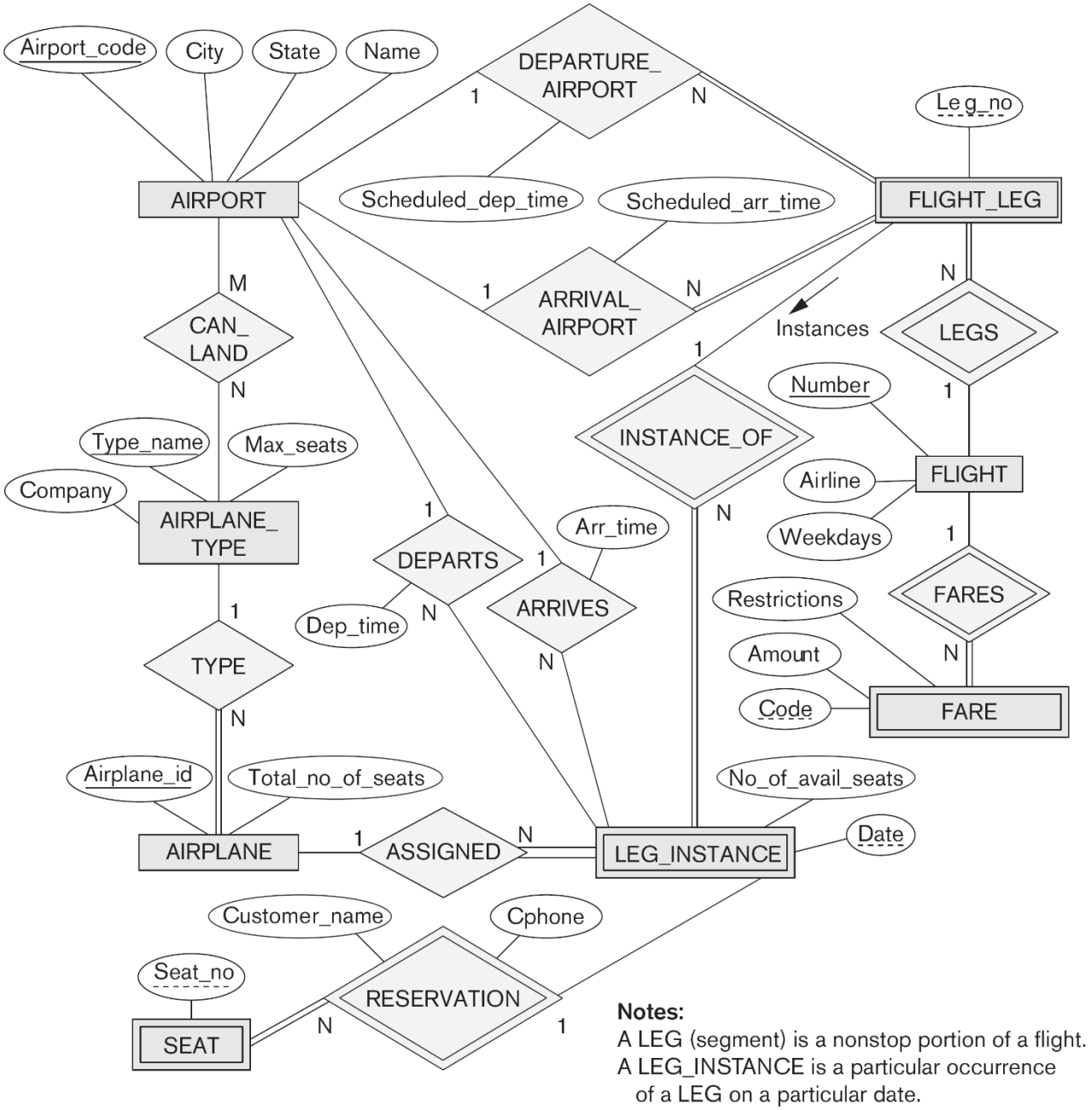
List the tables (and their attributes) generated from your ER diagram.

For these two questions, your ER diagram will depend on your interpretation of the questions. While grading, we'll check whether your tables link correctly to your ER diagram.

Question 4) (19)

Interpret Figure 3.21 airline ER schema.
Develop the relations from the ER diagram. D**o not specify all the attributes, only the keys, foreign keys, and inter-relationship attributes**. Mention all candidate keys for each table. Also, specify the rule used to create a tables and/or attribute.

An ER diagram for an AIRLINE database schema.



1. Strong Entity Rule:
2. Weak Entity Rule:
3. 1:1 Relationship:
4. 1:N Relationship:
5. M:N Relationship
6. Multivalued attribute:

Color maps to rule used.

Final Set of Tables (identify primary key and all candidate keys):

I AIRPORT (Airport_code , ...

II AIRPLANE_TYPE (Type_name , ---

III AIRPLANE (Airplane_id , ... , Type-name

IV FLIGHT (Number , ...

V FARE (Code , Number ,

VI FLIGHT_LEG (leg_no , Number , Scheduled_dep_time , Scheduled_arr_time , airport_code

Another candidate key: leg_no , Airport code

VII

LEG_INSTANCE (Date, leg_no, number, airplane_id, Airport_code, dep_time, arr_time

Another candidate key (Date, airplane_id)

VIII

SEAT (Seat_no, Date, leg_no, number, customer_name, Cphone)

IX CAN_LAND (Airport_code, type_name)