Database Systems and Web (15B11CI312)

Database Systems and Web

Lecture 8: Practice on EER and Relational Mapping

Contents to be covered

- Practice Problems

Question 1

Suppose JIIT Noida LRC wants to create a database to store details of its libraries, books and borrowers.

Details include the following:

A book has a unique ISBN number, a title and one or more authors. The library service may own several copies of a given book, each of which is located in one of the service's libraries. A given library contains many books, and in order to distinguish different copies of the same book a library assigns a different copy-number to each of its copies of a given book; the price that was paid for each copy is also recorded. Every library has a unique name and is either a main library or a branch library. A main library may have zero or more branch libraries and every branch library is a branch of exactly one main library. A borrower has a name and a unique ID code. A borrower can have many books on loan, but each copy of a book can only be on loan to one borrower. A borrower could borrow the same book on several occasions, but it is assumed that each such loan will take place on a different date.

Solution

Source: Fundamentals of database systems / Ramez Elmasri, Shamkant B. Navathe.—6th ed, Pearson Publications

Corrections

In the given solution there exists several errors.

Describe each error, clearly stating both the nature of the problem and its solution, and draw a corrected EER model.

Source: Fundamentals of database systems / Ramez Elmasri, Shamkant B. Navathe.—6th ed, Pearson Publications

Corrected EER

1. author should be a multivalued attribute.

2. location should be an identifying relationship.

3. Copy should have total participation in location.

4. a Loan can have only 1 Borrower.

5. number should be a discriminating attribute for Copy.

6. Branch should have total participation in the branch relationship.

7. no-of-branches should be an attribute on Main not Library.

8. specialization of Library should be disjoint.

9. Borrower should have a name attribute.

10. ISBN should be the key of book, not name.

Source: Fundamentals of database systems / Ramez Elmasri, Shamkant B. Navathe.—6th ed, Pearson Publications

Question 2

Consider a given ER diagram.

Map the ER model into a relational schema, clearly indicating all primary and foreign keys (also stating into which relations they are keys).

Source: Fundamentals of database systems / Ramez Elmasri, Shamkant B. Navathe.—6th ed, Pearson Publications

Solution

Manufacturer(**name, city, street**)

Part(**part-num, description, manufacturer**) **manufacturer is FK to Manufacturer**

Customer(**ID, name**)

Order(**customer, order-num**) **customer is FK to Customer**

Contains**(customer, order-num, part-num, quantity) customer, order-num is FK to Order**

part-num is FK to Part

Question 3

Suppose there exists a driver with unique Id which is associated with his name and phone number. Drives has a truck with license number and had associated maximum weight and maximum volume marks. He uses his truck for journey and also for trips under travel agency with unique trip numbers. On a single trip he carries more than one shipments having number, volume and weight. These shipments have to be dispatched at the end point with proper address. These end points are either in the form of warehouse having port or shop and pay with fixed opening hours. In addition, the shipments can be taken and dropped in between which will be marked with pickup and drop time on containment.

Draw and EER diagram of the problem.

Solution

Source: Fundamentals of database systems / Ramez Elmasri, Shamkant B. Navathe.—6th ed, Pearson Publications

Question

Convert the designed EER diagram into relational schema

Solution

Reduction rules:

Strong entity – all attributes of strong entity will be attributes of relation schema.

M-to-M relationship – separate table need to be created with the primary keys of all participating strong entity sets.

1-to-M relationship – PK of one side entity is included as FK in many side entity set.

Specialization – Super class is modeled as strong entity set. Sub-classes are included with the super class's primary key along with their own attributes as in 1-to-M relationship.

ER	Relational Schema

Strong Entity
Driver
Truck
Trip Shipment
	Driver(ID, Name, PhoneNo)
	Truck(LicNo, maxVol, maxWt)
	Trip(tripNo)
	Shipment(ShipNo, Vol, Weight)

M-to-M relationship
Binary - Journey
Ternary - Between
	Journey(ID, LicNo, tripNo)
	
	Stoppoint stores either FROM address or TO address. Hence, we have renamed Address attribute as follows;
	SBetween(ShipNo, From_Address, Pickup_time, To_Address, Dropoff_time)

1-to-M relationship Carries	No separate schema. But the many side strong entity set is added with one side's primary key. Shipment(ShipNo, Vol, Weight, tripNo)

Specialization
StopPoint
(super class entity)
Warehouse
(sub-class entity)
shopNpay
(sub-class entity)
	StopPoint(Address)
	
	Warehouse(Address, port)
	
	shopNpay(Address, openHrs)

Final set of relations

Driver(ID, Name, PhoneNo)

Truck(LicNo, maxVol, maxWt)

Trip(tripNo)

Shipment(ShipNo, Vol, Weight, tripNo) – **tripNo is foreign key** referencing Trip.

Journey(ID, LicNo, tripNo) – **ID, LicNo, and tripNo all are foreign keys** referencing Driver, Truck, and Trip relations respectively.

SBetween(ShipNo, From_Address, Pickup_time, To_Address, Dropoff_time) – **From_Address, To_Address are foreign keys** referencing StopPoint's Address attribute. **Pickup_time and Dropoff_time are descriptive attributes** of the ternary relationship SBetween.

StopPoint(Address)

Warehouse(Address, port) – Address is the foreign key referencing the super class's primary key.

shopNpay(Address, openHrs) - Address is the foreign key referencing the super class's primary key.

Exercise

A record company wishes to use a computer database to help with its operations regarding its performers, recordings and song catalogue. A requirements analysis has elicited the following information:

- Songs have a unique song number, a non-unique title and a composition date. A song can be written by a number of composers; the composer’s full name is required. Songs are recorded by recording artists (bands or solo performers). A song is recorded as a track of a CD. A CD has many songs on it, called tracks. CDs have a unique record catalogue number, a title and must have a producer (the full name of the producer is required). Each track must have the recording date and the track number of the CD.

- A song can appear on many (or no) CDs, and be recorded by many different recording artists. The same recording artist might re-record the same song on different CDs. A CD must have only 1 recording artist appearing on it. CDs can be released a number of times, and each time the release date and associated number of sales is required. Use this information to design an appropriate EER model.