1.8.2 Relational database modeling updated

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1.8.2
Relational...

1.8.2 Relational Database Modelling

May/June 2003

10. A sports club runs a number of sports teams. Each, any, many

Each team is made up of a number of members of the club and each member may play for more than one team. Each team has a number of coaches, but the coach's job is so time consuming that each coach can only coach one team.

Represent the above information on an entity relation (ER) diagram, in 3rd normal form, stating the primary key for each entity. [13]

Oct/NOV 2003

11. A garden design company keeps records of its customers. Each customer has had a design produced for them which will be one of a library of design types stored by the company.

Each design type uses plants. Each customer is sent an account based on the number of plants in the design.

(a) Draw an E-R (entity-relationship) diagram in third normal form, based on this information. [10]

(b) Each delivery of plants to the garden design company is identified by a batch number.

Explain how customers who received eucalyptus trees from batch 12 can be contacted. [4]

May/June 2004

1. (a) In relation to databases, describe what is meant by each of the following terms.

(i) Primary key. [1]

(ii) Secondary key. [1]

(iii) Foreign key. [1]

Oct/NOV 2004

2. A landscape garden company services a number of gardens. Each GARDEN is owned by an OWNER. Each owner may have more than one garden. Each garden has a number of PLANTS in it and each plant may be in a number of gardens.

Draw an entity relationship (E-R) diagram to represent this data model in third normal form and label the relationships. [10]

owns
GARDEN OWNER
GARDEN PLANT
PLANT
GARDEN OWNER
PLANT

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Oct/NOV 2006

2. (a) State what is meant by the terms:

(i) primary key,

(ii) secondary key,

(iii) foreign key

in the context of a table in a relational database. [3]

TEAM TEAM PLAYER PLAYER
TEACHER
Resolved.
TEAM PLAYER
TEACHER

Oct/NOV 2007

2. There are a number of TEAMs which represent a school.

Each team has a TEACHER who runs it and a teacher may run more than one team.

Each team has a number of PLAYERs and each one may play for more than one team.

Draw an entity relationship (E-R) diagram to represent this data model in third normal form and label the relationships. [6]

Oct/NOV 2008

3. Part of a school database consists of a table of student details and a table of teacher details.

A teacher teaches many students. ✓ TEACHER STUDENT

A student is taught by many teachers.

(a) (i) State the type of relationship between the two tables. Many to Many [1]

(ii) Explain how the relationship between the student and teacher tables can be normalised. [2]
By having a link table between teacher and student table and have many relationship resolved inside.

(iii) Draw the normalised relationship between the tables in the form of an entity-relationship (E-R) diagram. [3]

(b) Explain what is meant by each of the following terms and give an example of each from the tables in part (a).

(i) Primary key ✓ A field having unique data (item) which is used to identify a record or search a record.
Sort.

(ii) Foreign key [4]
✓ A copy of the field in a table from the PK of another table. It is used to maintain the relationship b/w tables.

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May/June 2009

4. A furniture shop sells a large number of different items whose details are stored in the STOCK table.

The shop has a large number of customers whose details are stored in the CUSTOMER table.

Some customers have an account. Each customer can only use one account. Some accounts can be used by more than one customer (for example all the members of one family may use the same account). Details of accounts are stored in the ACCOUNT table.

(a) Draw the relationship between the CUSTOMER and ACCOUNT tables in the form of an entity-relationship (E-R) diagram. [1]

A number of stock items will be stored on each account. Each type of stock item will be stored on many accounts.

(b) (i) State the type of relationship between the ACCOUNT and STOCK tables. M2M [1]

(ii) Draw the normalized relationship between the ACCOUNT and STOCK tables in the form of an E-R diagram. [2]

(c) By using examples from the CUSTOMER table, explain what is meant by:

(i) primary key, ✓ [2]

(ii) secondary key, ✓ [2]

(iii) foreign key. ✓ [2]

A AS S
Normalised
3NF

Oct/NOV 2009. P32

7. A library uses a computer system to store data in a database.

There are a large number of members of the library whose details are stored in the MEMBER table.

There are a large number of books, details of which are stored in the BOOK table.

Members can borrow books. Each member can borrow more than one book and each book can be borrowed by many members.

M B

(a) (i) State the type of relationship between the MEMBER and BOOK tables. M2M [1]

(ii) Draw the relationship between the MEMBER and BOOK tables in third normal form as an E-R diagram. [2]

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(b) Use examples of attributes in the MEMBER table to explain what is meant by:

(i) primary key, [2]

(ii) foreign key, [2]

(iii) secondary key. [2]

MEMBER SESSION
Many Many
ACTIVITY

Oct/NOV 2010. P31 ✓

2. The leaders of a youth club want to create a database to store details of:

MEMBERs, SESSIONs and ACTIVITYs.

The sessions are each evening from Monday to Friday. Each member can sign up for one or more of the five sessions.

Each session offers a number of activities but each activity is only offered in one of the sessions.

Draw an entity-relationship (E-R) diagram to represent this model in third normal form. [5]

BUILDING FIRM CONTRACT

Oct/NOV 2010. P33

2. A buildings maintenance company looks after a number of BUILDINGs in a city. Each BUILDING is occupied by one or more FIRMs. Each FIRM may have premises in more than one BUILDING. Each of the FIRMs has a CONTRACT with the company for their part of the BUILDINGs. Some of the FIRMs may share a CONTRACT.

Draw an entity-relationship (E-R) diagram to represent this data model in third normal form. [5]

May/June 2011. P31

10. A country has a national football competition based on leagues.

Each LEAGUE has a number of TEAMs but each TEAM is only in one LEAGUE.

Each TEAM plays at a number of GROUNDs during the season and each GROUND will host a number of TEAMs during the season.

(i) State the relationship between LEAGUE and TEAM.

Draw the entity-relationship (E-R) diagram to show this relationship. [2]

(ii) State the relationship between TEAM and GROUND.

Draw the E-R diagram to show this relationship. [2]

(iii) Explain how the relationship between TEAM and GROUND can be designed in third normal form. [4]

May/June 2011. P33

1.8.2 Relational Database Modelling

10. A farm has a number of FIELDs. A number of CROPs are grown on the farm.

Each CROP is grown in a number of FIELDs but each FIELD only grows one CROP.

A number of different FERTILISERs are used on each FIELD and each FERTILISER can be used on many FIELDs.

(i) State the relationship between FIELD and CROP.

Draw the entity-relationship (E-R) diagram to show this relationship. [2]

(ii) State the relationship between FERTILISER and FIELD.

Draw the E-R diagram to show this relationship. [2]

(iii) Explain how the relationship between FERTILISER and FIELD can be designed in third normal form. [4]

Oct/NOV 2011. P32

7 Data about patients, doctors and treatments in a hospital are stored in a relational database. PATIENTs are seen by one DOCTOR, and each DOCTOR has many PATIENTs. Each PATIENT can be receiving more than one TREATMENT and each TREATMENT can be given to more than one PATIENT.

(a) Draw an entity-relationship (E-R) diagram to represent:

(i) the relationship between PATIENT and DOCTOR [1]

(ii) the relationship between PATIENT and TREATMENT in third normal form. [3]

(b) State the meaning of each of the following terms and illustrate each of your answers with an example from this database.

(i) Primary key [2]

(ii) Foreign key [2]

(iii) Secondary key [2]

Oct/NOV 2011. P33

6. (b) Data about guests in a hotel are stored in a relational database. One part of the database consists of a table of GUEST details. This is linked to a table ACCOUNT.

Whenever a guest orders something in the hotel, the charge for that service is stored in the ACCOUNT table.

(i) State the primary key of the GUEST table, justifying your choice. [2]

(ii) State a secondary key in the ACCOUNT table, justifying your choice. [2]

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(iii) State what is meant by a foreign key. [1]

(iv) State a foreign key in the ACCOUNT table, justifying your choice. [2]

May/June 2012. P31/32

1 A database is designed to store data about students at a college and the subjects that they study.

- All students are based in a tutor group
- A tutor supervises all the students in their tutor group
- Each subject has one subject teacher only
- Students study a number of subjects

The following table StudentSubjects was a first attempt at the database design.

Table: `StudentSubjects`

StudentName	TutorGroup	Tutor	Subject	Level	SubjectTeacher
Tom	6	SAN	Physics	A	SAN
			Chemistry	A	MEB
			Gen. Studies	AS	DIL
Joe	7	MEB	Geography	AS	ROG
			French	AS	HEN
Samir	6	SAN	Computing	A	VAR
			Chemistry	A	MEB
			Maths	A	COR
			Gen. Studies	AS	DIL

(a) (i) Explain why the table is not in First Normal Form (1NF). [1]

(ii) Explain your answer by referring to the above data. [1]

(b) The design is changed to the following:

`Student (StudentName, TutorGroup, Tutor)`

`StudentSubjectChoices (StudentName, Subject, Level, SubjectTeacher)`

Using the data given in the original table, show how this data is now stored in the revised table designs.

Table: `Student`

StudentName	TutorGroup	Tutor

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Table: `StudentSubjectChoices`

StudentName	Subject	Level	SubjectTeacher

[3]

(c) (i) Explain what is meant by a primary key. [2]

(ii) A student is not allowed to choose the same subject at A Level and AS. What is the primary key of table `StudentSubjectChoices`? [1]

(iii) There is a relationship between tables `Student` and `StudentSubjectChoices`. Explain how the relationship is established using a primary key and foreign key. [2]

(d) The design of table `StudentSubjectChoices` is:

`StudentSubjectChoices (StudentName, Subject, Level, SubjectTeacher)`

Explain why this table is not in Second Normal Form (2NF). [2]

(e) The design of table `Student` is:

`Student (StudentName, TutorGroup, Tutor)` Explain why this table is not in Third Normal Form (3NF). [2]

May/June 2012. P33

1 A database is designed to store data about all aircraft owned by an airline and the flight schedules.

The following table AircraftSchedule was a first attempt at part of the database design.

Table: AircraftSchedule

AircraftID	Type	YearBought	FlightCode	Departure	Arrival
1	747	1998	2032	Delhi	Singapore
			1187	Singapore	Melbourne
			1326	Melbourne	Tokyo
			1556	Tokyo	Delhi
2	747-400	2007	1426	Bristol	Amsterdam
			1327	Amsterdam	Bristol
			5564	Bristol	Rome
			7865	Rome	Istanbul
3	747-400	2007	1090	London	New York
			1165	New York	Boston

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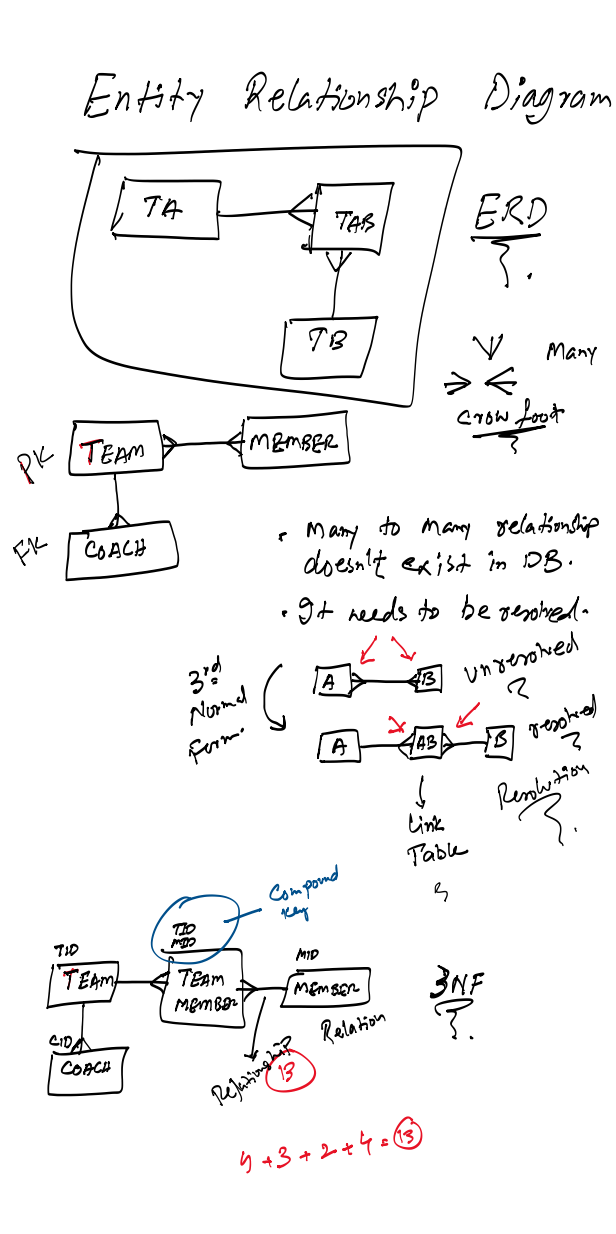
(a) (i) Explain why the table is not in First Normal Form (1NF). [1]

(ii) Explain your answer in terms of the data above. [1]

(b) The design is changed to the following:

Entity Relationship Diagram



- Many to Many relationship doesn't exist in DB.
- It needs to be resolved.

$4+3+2+4=13$

Keys (Field; special fields):

PK: identify each record uniquely.

FK: a PK of another table that is used to create relationship with another table.

Non key: a field that is not a PK.

Alternate key / Secondary: Another key/field that can be used as PK.

Candidate keys: Before assigning a key as PK all possible PKs are called candidate keys.

Compound key / composite: A primary key made up of more than one fields. It is a must feature of the link table as link tables always have compound key.