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<td><strong>3B-TPSW, PPR1/Project Team Roles</strong></td>
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<td><strong>Chap. 3</strong></td>
<td><strong>Rel. Model/Normalization</strong></td>
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<td><strong>Chap. 4</strong></td>
<td><strong>4. DB Design Using Normalization</strong></td>
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MODULE II: DATABASE DESIGN & IMPLEMENTATION

Part 3: Relational Model and Normalization (Text: Chapter 3)

NOTES FOR CLASS SESSION

STARTING POINTS

Questions to begin our deliberation

1. Why is it important to learn design of databases from existing data?
2. What theory can you use to judge the advantages and disadvantages of a certain database design?

Student Learning Objectives (Desired Outcomes)

At the end of in-class and outside-class work on this topic, you should be able to:

1. Explain basic relational terminology. [Comprehension]
2. Explain the characteristics of relations. [Comprehension]
3. Describe alternative terminology used in describing the relational model. [Comprehension]
4. Identify functional dependencies and identify determinants and dependent attributes. 
   [Comprehension]

5. Identify primary, candidate, and composite keys. 
   [Comprehension]

6. Identify possible insertion, deletion, and update anomalies in a relation. [Comprehension]

7. Place a relation in BCNF normal form. [Application]

8. Identify multivalued dependencies. [Comprehension]

9. Place a relation in 4th normal form. [Application]

QUESTIONS TO EXPLORE READINGS

Q 1. Why is it important to evaluate the design of tables stored in a database?

Q 2. What is the basic goal of normalization?

Q 3. What exactly is meant for an attribute to be a determinant?

Q 4. What exactly is meant by functional dependency?

Q 5. What is meant by the normal forms, BCNF and 4NF?

PROBLEMS (Part 3; Chapter 3)

Problem 3A (In-Class Problem)
Company Database Design Problem

In the process of designing a database for a company, you come across a table shown below that contains information on project meetings. Using your knowledge of relational model and normalization, you want to determine if the table meets the criteria for a good design or it can be transformed into a better design.

STAFF_MEETING (EmployeeName, ProjectName, Date)

The rows of this table record the fact that an employee from a particular project attended a meeting on the given date. Assume the following:
-- A project meets at most once every day.
-- Only one employee represents a given project.
-- Employees can be assigned to multiple projects.

(a) State the functional dependencies in the table.

(b) Find out if the table is in BCNF. If it is not in BCNF then transform it into one or more tables in BCNF. Identify the primary keys, candidate keys, foreign keys, and referential integrity constraints.

(c) Is your design in part (b) an improvement over the original table? What advantages and disadvantages does it have?
Problem 3B (Outside-Class Problem: Team problem solution work submission due by next class; team problem solution presentation and discussion in the next class)

MARCIA’S DRY CLEANING

Utilizing your knowledge of the relational model and normalization you want to analyze Marcia’s initial database design and possibly improve it.

(a) Consider the following table that contains data about customers:

CUSTOMER (Phone, FirstName, LastName)

Explain the conditions under which the following are true:

(i) Phone $\rightarrow$ (FirstName, LastName)

(ii) (Phone, FirstName) $\rightarrow$ LastName

(iii) (Phone, LastName) $\rightarrow$ FirstName

(iv) (LastName, FirstName) $\rightarrow$ Phone

(v) Phone $\rightarrow\rightarrow$ LastName

(vi) Phone $\rightarrow\rightarrow$ FirstName

(vii) Phone $\rightarrow\rightarrow$ (FirstName, LastName)

Is condition (vii) the same as conditions (v) and (vi)? Why or why not?

(b) Consider the tables:
CUSTOMER (Phone, FirstName, LastName)
ORDER (OrderNumber, DateIn, DateOut, Phone)

State an appropriate referential integrity constraint.

(c) Consider the tables:

CUSTOMER (Phone, FirstName, LastName)
ORDER (OrderNumber, DateIn, DateOut, FirstName, LastName)

What does the following referential integrity constraint mean?

ORDER (FirstName, LastName) must be in CUSTOMER (FirstName, LastName)

Is this constraint the same as:

ORDER (FirstName) must be in CUSTOMER (FirstName)

and

ORDER (LastName) must be in CUSTOMER (LastName)

Explain why or why not.

(d) Do you prefer the design in (b) or the design in (c)? Explain your reasoning.
Study Guide Chapter 3 (SG-Ch3)

http://wps.prenhall.com/bp_kroenke_database_10/30/7927/2029501.cw/index.html

Self-Test 3 (ST3)

Available at the uLearn site for the course. (Available only between the end of this session and the start of the next session)