San Jose State University

Department of Computer Science

Introduction to Database Management Systems (CS 157-A, Section 7)

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Homework #2 (5 pts) Preview

Theory of RDBMS

The purpose of this quick assignment is to make sure everyone is familiar with the RDBMS FD and querying an existing schema; this is an individual assignment.

1. Q1 [1.5 pts]: For each of the following relation schemas and set of FD's:

a. R(A,B,C,D) with FD's AB → C, C → D, and D → A

b. R(A,B,C,D) with FD's B → C and B → D

c. R(A,B,C,D) with FD's AB → C, BC → D, CD → A and AD → B

d. R(A,B,C,D) with FD's A → B, B → C, C → D and D → A

e. R(A,B,C,D,E) with FD's AB → C, DE → C, and B → D

f. R(A,B,C,D,E) with FD's AB → C, C → D, D→ B, and D → E

Do the following:
a) Indicate all the BCNF violations. Do not forget to consider FD's that are not in the given set, but follow from them. However, it is not necessary to give violations that have more than one attribute on the right side?

Answer-a)

You need first to find non-trivial FDs for each relation

Find all possible PK = {AB, BC, BD}

Find for each of the above relations if any of its FDs in in BCNF violation?

b) Decompose the relations, as necessary, into collections of relations that are in BCNF?

Answer-b)

Select non-trivial FD (B → C) which is not BCNF compliant and compute the closure on B using all the non-trivial FDs for (b).
decompose R into two tables…..

2. Q2 [1 pt]: Let R(A,B,C,D,E) be decomposed into relations with the following three sets of attributes: {A,B,C}, {B,C,D}, and {A,C,E}. For each of the following sets of FD's, use the chase test to tell whether the decomposition of R is loosless. For those that are not loosless, give an example of an instance of R tha returns more than R when projected onto the decomposed relations and rejoined:

   a) B → E and CE → A

   Answer-a)

   1. This is the initial tableau:

A	B	C	2. D	E
a	b	c	d_1	e_1
a_1	b	c	d	e_1
a	b_1	c	d_1	e

This is the final tableau after applying FDs B→E and CE→A.

A	B	C	D	E
a	b	c	d_1	e_1
a	b	c	d	e_1
a	b_1	c	d_1	e

Since there is not an unsubscripted row, the decomposition for R is not lossless for this set of FDs.

We can use the final tableau as an instance of R as an example for why the join is not lossless. The projected relations are:

A	B	C
a	b	c
a	b_1	c

B	C	D
b	c	d_1
b	c	d
b_1	c	d_1

A	C	E
a	c	e_1
a	c	e

The joined relation is:

A	B	C	D	E
a	b	c	d_1	e_1
a	b	c	d	e_1
a	b_1	c	d_1	e
a	b_1	c	d_1	e_1
a	b	c	d_1	e
a	b	c	d	e

The joined relation has three more tuples than the original tableau. Since there is not an un-subscripted row, the decomposition for R is not lossless for this set of FDs.

3. Q3 [1.5 pts]: Write the following queries based on the following schema:
Movies(title, year, length, genre, studioName, producerC#)
StarsIn(movieTitle, movieYear, starName)
MovieStar(name, address, gender, birthdate)
MovieExec(name, address, cert#, netWorth)
Studio(name, address, presC#)
in SQL:

a) Find the address of MGM studios?

Answer-a)

```
SELECT   address AS Studio_Address
FROM     Studio
WHERE     NAME = 'MGM';
```

4. Q4 [1 pt]: Write the following queries based on the following schema:
Movies(title, year, length, genre, studioName, producerC#)
StarsIn(movieTitle, movieYear, starName)
MovieStar(name, address, gender, birthdate)
MovieExec(name, address, cert#, netWorth)
Studio(name, address, presC#)
Write the following queries in SQL:

a) Who were the male stars in Titanic?

Answer-a)

```
SELECT   M.name AS starName
FROM     MovieStar M, StarsIn S
WHERE     M.name         = S.starName     AND
          S.movieTitle = 'Titanic'          AND
          M.gender       = 'M';
```