CSC430/530 – Database Management Systems

Assignment #4 – Functional Dependencies & Normalization

Matthew Mahan

1. Consider following relation for published books:

BOOK

Book_title	Author_name	Book_type	List_price	Author_affil	Publisher

FD1, FD2, FD3

- *Author_affil* refers to the affiliation of the author.
- Primary key is {*Book_title, Author_name*}.
- Functional dependencies are:
  FD1: *Book_title -> Publisher, Book_type*
  FD2: *Book_type -> List_price*
  FD3: *Author_name -> Author_affil*

a. What normal form this relation in (1NF, 2NF, 3NF)? Justify your answer by describing violations of normal forms (if any).

This Table is in 1NF. There are no multivalued attributes; it is flat. This Table is not in 2NF because Author_affil is not dependent on the full key. This Table is not in 3NF because list_price is dependent on Book_type which is not a key.

b. Describe steps to normalize this relation up to 3NF. For full points, show all decomposed relations.

2NF: Decompose into relations where partial keys are the foreign keys.

BOOK

Book_title	Autor_name

AFFILIATED_WITH

Author_name	Affiliation

PUBLISHING_DETAILS

Book_title	Publisher	Book_type	List_price

3NF: Decompose recursive functional dependencies.

BOOK

Book_title	Author_name

AFFILIATED-WITH

Author_name	Affiliation

PUBLISHING_DETAILS

Book_title	Publisher	Book_type

PRICING

Book_type	List_price

2. Define which of the provided functional dependencies may hold for the given relation. If the dependency does not hold, explain why by specifying tuples that cause the violation.

	Instructor	Course	Text	Quarter
1	Smith	Data Structures	Bartam	Spring
2	Hall	Systems Programming	White	Winter
3	Brown	Programming Languages	Williams	Summer
4	Smith	Data Structures	Bartam	Winter
5	Ross	Data Mining	Williams	Summer
6	Hall	Systems Programming	White	Spring
7	Johnson	Databases	Elmasri	Fall

A. Text -> Course DOES NOT HOLD

B. Text -> Instructor DOES NOT HOLD

C. Instructor -> Course HOLDS

D. Course -> Text HOLDS

E. Course -> Quarter DOES NOT HOLD

A) Tuples 3, 5 | 3 | Williams → Programming Languages
5 | Williams → Data Mining

B) Tuples 3 | Williams → Brown
5 | Williams → Ross

E) Tuples 1 | Data Structures → Spring
4 | Data Structures → Winter
2 | Systems Programming → Winter
6 | Systems Programming → Spring