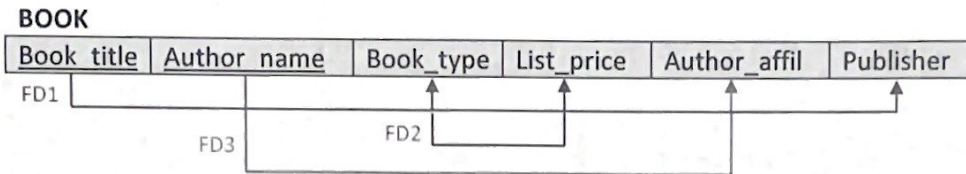


CSC430/530 – Database Management Systems  
Assignment #4 – Functional Dependencies & Normalization

Matthew Mahan

1. Consider following relation for published books:



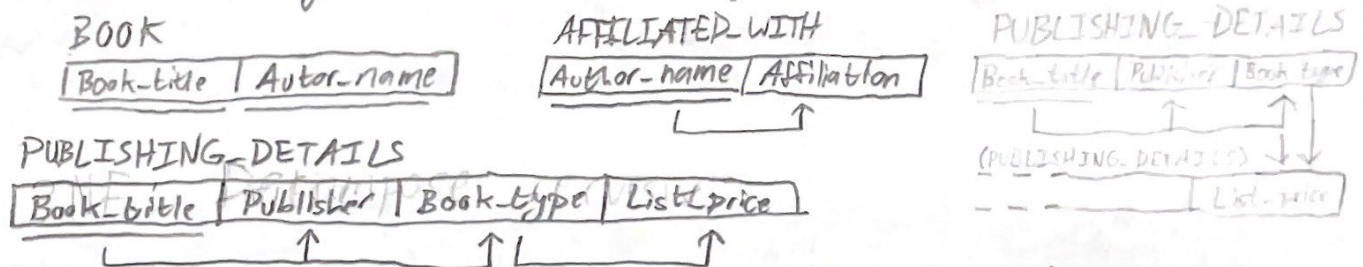
- Author\_affil refers to the affiliation of the author.
- Primary key is {Book\_title, Author\_name}.
- Functional dependencies are:  
FD1: Book\_title → Publisher, Book\_type  
FD2: Book\_type → List\_price  
FD3: Author\_name → Author\_affil

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

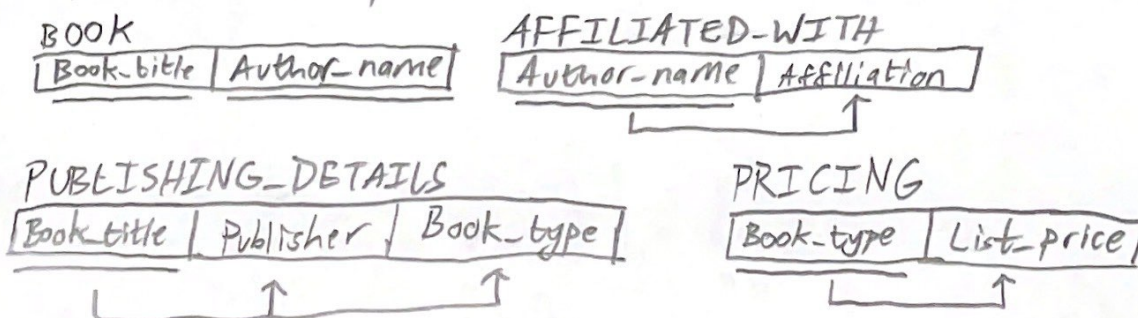
This Table is in 1NF. There are no multivalued attributes; it is flat. This Table is not in 2NF because Author-affil is not dependent on the full key. This Table is not in 3NF because list-price is dependent on Book-type which is not a key.

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.



3NF: Decompose recursive functional dependencies.



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  $\rightarrow$  Course **DOES NOT HOLD**

B. Text  $\rightarrow$  Instructor **DOES NOT HOLD**

C. Instructor  $\rightarrow$  Course **HOLDS**

D. Course  $\rightarrow$  Text **HOLDS**

E. Course  $\rightarrow$  Quarter **DOES NOT HOLD**

A) Tuples 3, 5 | Williams  $\rightarrow$  Programming Languages  
5 | Williams  $\rightarrow$  Data Mining

B) Tuples 3 | Williams  $\rightarrow$  Halltown  
5 | Williams  $\rightarrow$  Ross

E) Tuples 1 | Data Structures  $\rightarrow$  Spring  
4 | Data Structures  $\rightarrow$  Winter  
2 | Systems Programming  $\rightarrow$  Winter  
6 | Systems Programming  $\rightarrow$  Spring