# CSC430/530 – Database Management Systems

Assignment #4 – Functional Dependencies & Normalization

1. Consider following relation for published books:

# BOOK

FD1



FD3

FD2

Publisher

Author\_affil

List\_price

Book\_type

Author\_name

Book\_title

* + *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*

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

**This relation is in 1NF.**

**FD1 violates 2NF.**

**The non-prime attributes Book\_type and Publisher are partially functionally dependent on Book\_title.**

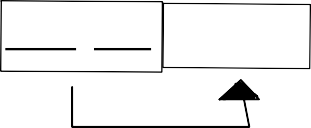
**FD3 violates 2NF.**

**Author\_affil is partially functionally dependent on Author\_name.**

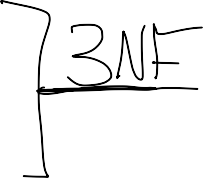
**FD2 violates 3NF.**

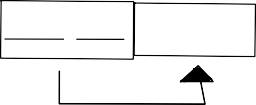
**Transitive dependency formed by Book\_title -> Book\_type and Book\_type -> List\_price.**

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



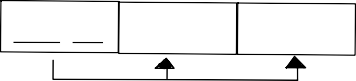
Author\_name Author\_aﬃl





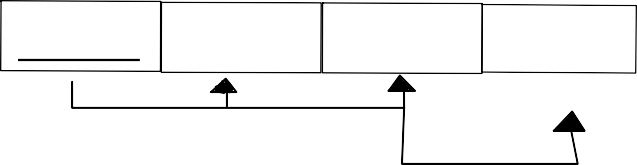
Author\_name Author\_aﬃl

Book\_type List\_price



Book\_title Publisher

Book\_type



Book\_title

Publisher

Book\_type List\_price

1. 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.
2. Text -> Course

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **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 |

1. Text -> Instructor
2. Instructor -> Course
3. Course -> Text
4. Course -> Quarter
5. **Doesn't hold. (Williams -> Programming Languages and Williams -> Data Mining) 3 & 5 violate it.**
6. **Doesn't hold. (Williams -> Brown and Williams -> Ross) 3 & 5 violate it.**
7. **Holds.**
8. **Holds.**
9. **Doesn't hold. (Data Structures -> Spring and Data Structures -> Winter) 1 & 4 violate it.**