

# Database system

## Assignement 1 Solution2

### Apr 2024 Semester

Name: Jeslyn Ho Ka Yan:

ID: 10241485

## Table of Content

1	FIND ALL MINIMAL KEYS .....	3
2	FIND THE HIGHEST NORMAL FORM .....	4
3	DECOMPOSE THE RELATIONAL TABLE INTO BCNF .....	5

## 1 Find all minimal keys

Book (bookTitle, authorName, bookType, listPrice, authorAffil, publisher)

Functional dependencies:

- bookTitle  $\rightarrow$  publisher, bookType
- bookType  $\rightarrow$  listPrice
- authorName  $\rightarrow$  authorAffil

### Find the minimal super key.

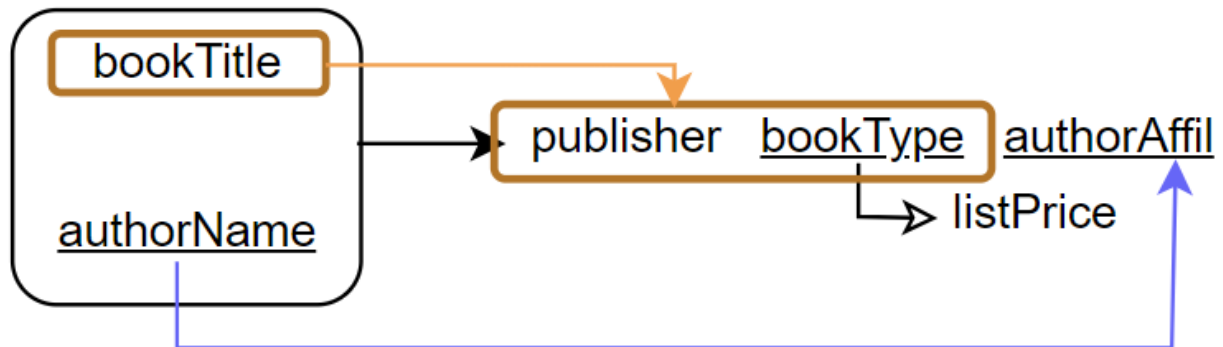
$\{ \text{bookTitle} \}^+$   
=  $\{ \text{bookTitle} \}$   
=  $\{ \text{bookTitle}, \text{publisher}, \text{bookType} \}$  (using bookTitle  $\rightarrow$  publisher, bookType)  
=  $\{ \text{bookTitle}, \text{publisher}, \text{bookType}, \text{listPric} \}$  (using bookType  $\rightarrow$  listPric )

If bookTitle  $\rightarrow$  publisher, bookType, listPric and authorName  $\rightarrow$  authorAffil,  
then through using composite inference rule, we have,  
bookTitle, authorName  $\rightarrow$  publisher, bookType, listPric, authorAffil.

$\{ \text{bookTitle}, \text{authorName} \}^+ = \{ \text{bookTitle}, \text{authorName}, \text{publisher}, \text{bookType}, \text{listPric}, \text{authorAffil} \}$

**Ans: Hence, the minimal super key is (bookTitle, authorName)**

## 2 Find the highest Normal form



Since (bookTitle, authorName) is the minimal super key,  
there exist a partial Functional dependency,  
 $\text{bookTitle} \rightarrow \text{publisher, bookType}$  and  
 $\text{bookType} \rightarrow \text{listPrice}$  and  
 $\text{authorName} \rightarrow \text{authorAffil}$ . Which violates 2NF requirements.

**Ans: Hence, the relational schema R is in 1NF**

### 3 Decompose the Relational Table into BCNF

Since there exist a partial dependency in the relational schema R, to transform the relational schema to BCNF, we need to remove the partial dependency, and split it into three relational shcemas

**R1=( authorName, bookTitle),**  
**R2=( authorName, authorAffil) and**  
**R3= (bookTitle, publisher bookType)**

---

**In relational schema R1=**  
**( authorName, bookTitle),**

the minimal super key is **(authorName, bookTitle),**

and the relational shcema R have no partial dependency, transitive dependency and non-trivial dependency violations. Hence, the relational schema R1= **(authorName, bookTitle)** is in BCNF.

---

**In relational schema R2=( authorName, authorAffil),**

the minimal super key is **(authorName),**

and the relational shcema R have no partial dependency, transitive dependency and non-trivial dependency violations. Hence, the relational schema R2=( **authorName, authorAffil**) is in BCNF.

---

**In relational schema R3=( bookTitle, publisher, bookType),**

the minimal super key is **(bookTitle),**

however, there exist a partial dependency of bookType → listPrice. (a violation of 2NF). To transfrom the relation schema R3 to BCNF, we have to remove the partial dependency by splitting R3 into

**R4=( bookType, list price) and**  
**R5(bookTitle, publisher)**

---

**In relational schema R4=**

( **bookType**, list price),

the minimal super key is (**bookType**),

and the relational schema R have no partial dependency, transitive dependency and non-trivial dependency violations. Hence, the relational schema R4= (**bookType**, list price) is in BCNF.

---

**In relational schema R5 =  
(bookTitle, publisher)**

the minimal super key is (**bookTitle**),

and the relational schema R have no partial dependency, transitive dependency and non-trivial dependency violations. Hence, the relational schema R5= (**bookTitle**, publisher) is in BCNF.