Database system

Assignement 1 Solution 1

Apr 2024 Semester

Name: Jeslyn Ho Ka Yan:

ID: 10241485

Table of Content

1 Find all functional and multivalued dependencies

CUSTOMER (custPhone,name,preferences(0…*))
custPhone→ name
custPhone ↠ preferences

BOOKING (custPhone, studioName, startDateTime, duration, specialRequest(0…*)**)**
custPhone, studioName, startDateTime → duration
custPhone, studioName, startDateTime ↠ specialRequest

KTVSTUDIO (studioName, location, equipmentList(0…*), rateType)
studioName→ location
studioName ↠ equipmentList
studioName → rateType

RATE(rateType, unitPrice)
rateType→ unitPrice

2 Find all minmal keys

CUSTOMER:

Closure of attribute { custPhone }$^+$
={ custPhone }
={ custPhone, name } (using custPhone→ name)

Closure of attribute { custPhone, preferences }$^+$
={ custPhone, preferences }

Since not all of the attributes are derived by any closure set of the determinant. All of the closure attributes must be combined using the composite rule:
{ custPhone, preferences }$^+$ ={ custPhone, preferences, name}

All the attributes are in the closure **{ custPhone, preferences }$^+$**

Ans: Hence, the minimal super key is (custPhone, preferences) in the relational schema CUSTOMER.

BOOKING:

Closure of attribute { custPhone, studioName, startDateTime **}$^+$**
={ custPhone, studioName, startDateTime}
={ custPhone, studioName, startDateTime, duration}
(using custPhone, studioName, startDateTime → duration)

Closure of attribute { custPhone, studioName, startDateTime, specialRequest **}$^+$**
= **{** custPhone, studioName, startDateTime, specialRequest **}**

Since not all of the attributes are derived by any closure set of the determinant. All of the closure attributes must be combined using the composite rule:

{ custPhone, studioName, startDateTime, specialRequest }$^+$
= **{** custPhone, studioName, startDateTime, specialRequest, duration **}**

All the attributes are in the closure **{ custPhone, studioName, startDateTime, specialRequest }$^+$**

Ans: Hence, the minimal super key is (custPhone, studioName, startDateTime, specialRequest) in the relational schema BOOKING.

KTVSTUDIO:

If studioName→ location and studioName → rateType,then through union rule, studioName → location, rateType.

Closure of attribute { studioName **}**$^+$
={ studioName }
={ studioName, location, rateType }

Closure of attribute { studioName, equipmentList **}**$^+$
={ studioName, equipmentList }

Since not all of the attributes are derived by any closure set of the determinant. All of the closure attributes must be combined using the composite rule:
{ studioName, equipmentList }$^+$ ={ studioName, equipmentList, location, rateType }

All the attributes are in the closure **{ studioName, equipmentList }**$^+$

Ans: Hence, the minimal super key is (studioName, equipmentList) in the relational schema CUSTOMER.

RATE:
Closure of attribute { rateType **}**$^+$
={ rateType }
={ rateType, unitPrice } (using rateType→ unitPrice)

rateType→ unitPrice is valid Functional depedenency

Ans: Hence, the minimal super key is (rateType)

---

3 Find the highest normal from for each Relational Schemas

CUSTOMER Relational Table

custPhone, preferences → custPhone, preferences, name
custPhone → name
custPhone, preferences → custPhone, preferences

There exist a mulit-valued attribute of preferences.The existence of mulitvalue attributes violates the 1NF requirement.
Ans: Hence, this relational schema CUSTOMER, is in 0NF.

BOOKING Relational Table:

custPhone, studioName, startDateTime, specialRequest→ custPhone, studioName, startDateTime, specialRequest, duration

custPhone, studioName, startDateTime → duration

custPhone, studioName, startDateTime, specialRequest→ custPhone, studioName, startDateTime, specialRequest

There exist a mulit-valued attribute of specialRequest. The existence of mulitvalue attributes violates the 1NF requirement.
Ans: Hence, this relational schema BOOKING, is in 0NF.

KTVSTUDIO Relational Table:

studioName, equipmentList → studioName, equipmentList, location, rateType

studioName → location, rateType

studioName, equipmentList → studioName, equipmentList

There exist a mulit-valued attribute of equipmentList. The existence of mulitvalue attributes violates the 1NF requirement.
Ans: Hence, this relational schema KTVSTUDIO , is in 0NF.

RATE Relational Table:

rateType→ unitPrice

Since(rateType) is the minimal super key.
There is no mulit-value attribute in this relational schema. Its in 1NF
There is no partial dependency in this relational schema. Its in 2NF
There is no transitive dependency in this relational schema. Its in 3NF
There is no non-trival dependency in this relational schema. Its in BCNF

Ans: Hence, the relational schema RATE is in BCNF

4 Transfrom relational shcema into 4NF

CUSTOMER:

The relational schema CUSTOMER must first transform into 1NF by eliminating the multi-value attribute before it can be broken down into 4NF. A new separate relational schema will be created.

PREFERENCE (custPhone, preference)
FD: (custPhone, preference)
the minimal super key is (**custPhone, preference**),

In order to create a single instance value, the multi-value attribute "preference" has been handled by composing it with the attribute "custPhone," and it is in 1NF. There is no partial dependency, no transitive dependency, no non-trival dependency and no multi-valued dependency.
ANS: Hence, this this relational schema PREFERENCE is in 4NF

CUSTOMER (custPhone, name)
FD: (custPhone) → name
the minimal super key is (**custPhone**),

and all attributes are atomic, the relational shcema R have no partial dependency, transitive dependency and non-trivial dependency violations. Hence, the relational schema CUSTOMER= **(custPhone, name**) is in BCNF.
ANS: Hence, this this relational schema CUSTOMER is in BCNF

BOOKING:

The relational schema BOOKING must first transform into 1NF by eliminating the multi-value attribute before it can be broken down into 4NF. A new separate relational schema will be created.

SPECIALREQUEST (custPhone, studioName, startDateTime, specialRequest)

FD: (custPhone, studioName, startDateTime, specialRequest)

the minimal super key is **(custPhone, studioName, startDateTime, specialRequest)**,

In order to create a single instance value, the multi-value attribute "specialRequest" has been handled by composing it with the attribute "custPhone, studioName, startDateTime," and it is in 1NF. There is no partial dependency, no transitive dependency, no non-trival dependency and no multi-valued dependency.
ANS: Hence, this this relational schema SPECIALREQUEST is in 4NF

BOOKING (custPhone, studioName, startDateTime, duration)
FD: (custPhone, studioName, startDateTime) → duration

the minimal super key is **(custPhone, studioName, startDateTime),**

and all attributes are atomic, the relational shcema R have no partial dependency, transitive dependency and non-trivial dependency violations. Hence, the relational schema BOOKING = **(custPhone, studioName, startDateTime, duration)** is in BCNF.
ANS: Hence, this this relational schema BOOKING is in BCNF

KTVSTUDIO:

The relational schema BOOKING must first transform into 1NF by eliminating the multi-value attribute before it can be broken down into 4NF. A new separate relational schema will be created.

EQUIPEMENTLIST (studioName, equipmentList)
FD: (studioName, equipmentList)
the minimal super key is **(studioName, equipmentList),**

In order to create a single instance value, the multi-value attribute "equipmentList " has been handled by composing it with the attribute "studioName" and it is in 1NF. There is no partial dependency, no transitive dependency, no non-trival dependency and no multi-valued dependency.
ANS: Hence, this this relational schema EQUIPEMENTLIST is in 4NF

KTVSTUDIO (studioName, location, rateType)
FD: (studioName) → location, rateType

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

and all attributes are atomic, the relational shcema R have no partial dependency, transitive dependency and non-trivial dependency violations. Hence, the relational schema KTVSTUDIO = **(studioName, location, rateType)** is in BCNF.
ANS: Hence, this this relational schema KTVSTUDIO is in BCNF

RATE:

rateType→ unitPrice
the minimal super key is (rateType),

The highest normal form for this relational schema RATE is BCNF, there is no need to make any changes to it, it can't be a 4Nf since there is no mulitple mulit-value dependecy.

Since, there is no mulit-value attribute, no partial dependency, no transitive dependency and no non-trival dependency. It is BCNF
Ans: Hence, the relational schema RATE is in BCNF