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CSC715 Database

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Problem 7

1. Exercise 3.3.1 on page 92
   1. R(A, B, C, D) with FD’s AB🡪C, C🡪D, and D🡪A.

A+=A, B+=B, C+=CD, D+=DA

FD’s violating BCNF:

* 1. R(A, B, C, D) with FD’s B🡪C, and B🡪D.

AB🡪ABCD, AB key, AB=prime attribute,

FD violating BCNF: CD

Decomposition:

R1(ABC) -- > AB🡪C

R2(CD) -- > C🡪D

* 1. R(A, B, C, D) with FD’s AB🡪C, BC🡪D, CD🡪A and AD🡪B.

AB+=ABCD, BD+=BCDA, CD+=CDAB, AD+=ADBC

BC+=(ABCD), CD+=(ABCD), AD+=(ABCD)

R(ABCD) is in BCNF already.

* 1. R(A, B, C, D) with FD’s A🡪B, B🡪C, C🡪D and D🡪A.
  2. R(A, B, C, D) with FD’s AB🡪C, DE🡪C, and B🡪D.

A+=A, B+=BD, C+=C, D+=D, E+=E

FD’s violating BCNF: AB🡪C, DE🡪C, B🡪D

Decomposition:

R1(ABC) -- > (AB🡪C), AB=key -- > AB🡪C in BCNF

R2(BD) -- > (B🡪D) B=key -- > B🡪D in BCNF

R3(DEC) -- > (DE🡪C) DE=key 🡪DE 🡪C in BCNF

Decomposition is: R1(ABC), R2(BD) and R3(DEC)

* 1. R(A, B, C, D) with FD’s AB🡪C, C🡪D, D🡪B and D🡪E.

AB+= ABCDE, C+=CDBE, D+=DBE

Violation: C🡪D, D🡪E

Decomposition:

R1(ABC) -- > AB🡪C

R2(CD) -- >C🡪D

R3(BDE) -- > D🡪BE

1. R(A, B, C, D, E) with FD’s A 🡪 B, C 🡪 D

Closures: AC+=ABCD

Violation:

1. R = (A, B, C, D, E) with FDs A 🡪 BC, CD 🡪 E, B 🡪 D, E 🡪 A

Closures: A+🡪BCDEA -- > A+=ABCDE

1. R = (A, B, C, D, E) with FDs A🡪CD, B🡪CE and E🡪B

Closures: A+=CDBE -- > BCDE

1. R = (A, B, C, D, E) with FDs A🡪B, CD🡪E

Closures: A🡪B

CD🡪E

1. R = (A, B, C, D, E) with FDs A🡪BCDE, E🡪FGH, I🡪J, AI🡪K and AL🡪M

Closures: A+=BCDEIJKLM

E+FGH

AE+=ABCDEFGHIJKL

1. R = Student(SID, class club)

Real world rules: Classes and clubs have nothing to do with each other

List of all mvds

Decompose Student using 4NF algorithm

1. Let Drinkers = (name, address, phones, beers)

With FDs: name 🡪 address

And MVDs: name 🡪 phones

name 🡪 beers

i.e. A drinker’s phones are independent of the beers they like. So each of a drinker’s hones appears with each of their beers

List all of the mvds

name 🡪phones, name 🡪beers

Key: {name, phones, beers}

Decompose drinkers using the 4NF algorithm

Name🡪address

Drinker1(name,address) -- > dependency = name🡪address

Drinker2(name, ohones, beers) -- > mvds: name 🡪🡪phones and name 🡪🡪beeers -- >

no FDs

MVD name 🡪🡪phones and name🡪🡪beers decompose to drinker3(name,phones) and

drinker4(name, beers)

1. Let Students = (Snum, address, Cnum, club)

With FD: Snum 🡪 address

And MVDs: Snum 🡪🡪 Cnum

Snum 🡪🡪club

Where student Snum may take any course Cnum and belong to any club

i.e. Courses taken by a student are independent of the clubs the student joins. So each of a students courses appears with each of her/his clubs.

List all of the MVDs.

Decompose students using the 4NF algorithm.