Aleksandr Kim

Laboratory work 5

1)

**Will the conversion to BCNF be dependency preserving in any case? Proof**
**your statement and give a reasoning for choosing BCNF design.**

**Answer:**

**No, a table is said to be in BCNF if and only if, for each nontrivial dependence of the form A → B, A is a superkey of R. BCNF is a stricter version of 3NF, in which 3NF decomposition occurs to reduce redundancy, but with the loss of dependencies**

**Proof:**

Let's say we have abc and c->b
It's not in BCNF

ac and cb
in BCNF, but we lost ab->c

2) 3NF

R

| UnitID | StudentID | Date | Tutor ID | Topic | Room | Grade | Book | TutEmail |
|---|---|---|---|---|---|---|---|---|
| U1 | St1 | 23.02.03 | Tut1 | GMT | 629 | 4.7 | Deumlich | tut1@fhbb.ch |
| U2 | St1 | 18.11.02 | Tut3 | Gln | 631 | 5.1 | Zehnder | tut3@fhbb.ch |
| U1 | St4 | 23.02.03 | Tut1 | GMT | 629 | 4.3 | Deumlich | tut1@fhbb.ch |
| U5 | St2 | 05.05.03 | Tut3 | PhF | 632 | 4.9 | Dümmlers | tut3@fhbb.ch |
| U4 | St2 | 04.07.03 | Tut5 | AVQ | 621 | 5.0 | SwissTopo | tut5@fhbb.ch |

R1

| UnitID | StudentID | Date | Tutor ID | Grade |
|---|---|---|---|---|
| U1 | St1 | 23.02.03 | Tut1 | 4,7 |
| U2 | St1 | 18.11.02 | Tut3 | 5,1 |
| U1 | St4 | 23.02.03 | Tut1 | 4,3 |
| U5 | St2 | 05.05.03 | Tut3 | 4,9 |
| U4 | St2 | 04.07.03 | Tut5 | 5 |

R2

| UnitID | Topic |
|---|---|
| U1 | GMT |
| U2 | Gln |
| U5 | PhF |
| U4 | AVQ |

R3

| Tutor ID | TutEmail |
|---|---|
| Tut1 | tut1@fhbb.ch |
| Tut3 | tut3@fhbb.ch |
| Tut5 | tut5@fhbb.ch |

R4

| Topic | Room | Book |
|---|---|---|
| GMT | 629 | Deumlich |
| Gln | 631 | Zehnder |
| PhF | 632 | Dummlers |
| AVQ | 621 | Swiss Topo |

3) 2NF

R

| **ProjectName** | **ProjectManager** | Position | **Budget** | TeamSize |
|---|---|---|---|---|
| Project1 | Manager1 | CTO | 1 kk $ | 15 |
| Project2 | Manager2 | CTO2 | 1.5 kk $ | 12 |

R1

| ProjectName | ProjectManager |
|---|---|
| Project1 | Manager1 |
| Project2 | Manage2 |

R2

| ProjectName | Budget | TeamSize |
|---|---|---|
| Project1 | 1 kk $ | 15 |
| Project2 | 1.5 kk $ | 12 |

R3

| ProjectManager | Position |
|---|---|
| Manager1 | CTO |
| Manage2 | CTO2 |

4) 3NF

*Faculties have a number of specialities, each speciality consists of a set of particular groups.*

| Group | Faculty | Speciality |
|---|---|---|
| g1 | f1 | s1 |
| g2 | f2 | s2 |

R

| Group | Faculty | Speciality | NumOfSpec | GroupsOfSpec |
|---|---|---|---|---|
| g1 | f1 | s1 | n1 | gs1 |
| g2 | f2 | s2 | n2 | gs2 |

R1

| Group | Faculty |
|---|---|
| g1 | f1 |
| g2 | f2 |

R2

| Faculty | Speciality |
|---|---|
| f1 | s1 |
| f2 | s2 |

R3

| Faculty | NumOfSpec |
|---|---|
| f1 | n1 |
| f2 | n2 |

R4

| Speciality | GroupsOfSpec |
|---|---|
| s1 | gs1 |
| s2 | gs2 |

5)

R

*Curator depends on projectID and related departments, teamSize directly relates to project and related departments, ProjectGroupsNumber depends on TeamSize.*

| ProjectID | Department | Curator | TeamSize | ProjectGroupsNumber |
|---|---|---|---|---|
| p1 | d1 | e1 | 100 | 5 |
| p2 | d2 | e2 | 120 | 6 |

R1

| ProjectID | Department | Curator | TeamSize |
|---|---|---|---|
| p1 | d1 | e1 | 100 |
| p2 | d2 | e2 | 120 |

R2

| ProjectID | Department | ProjectGroupsNumber |
|---|---|---|
| p1 | d1 | 5 |
| p2 | d2 | 6 |

6)

Our goals of database design with functional dependencies are:

1. BCNF. Information minimization
2. Losslessness.
3. Dependency preservation

1. Desirable

maintaining connections and minimizing information

R

| employeeID | emp_Name | clientID | c_Name |
|---|---|---|---|
| 111 | n1 | 123 | c1 |
| 121 | n2 | 124 | c2 |

R1

| employeeID | emp_Name | clientID |
|---|---|---|
| 111 | n1 | 123 |
| 121 | n2 | 124 |

R2

| clientID | c_Name |
|---|---|
| 123 | c1 |
| 124 | c2 |

2. Undesirable

repetition of information and loss of connections

R

*Curator depends on projectID and related departments, teamSize directly relates to project and related departments, ProjectGroupsNumber depends on TeamSize.*

| ProjectID | Department | Curator | TeamSize | ProjectGroupsNumber |
|---|---|---|---|---|
| p1 | d1 | e1 | 100 | 5 |
| p2 | d2 | e2 | 120 | 6 |

R1

| ProjectID | Department | Curator | TeamSize |
|---|---|---|---|
| p1 | d1 | e1 | 100 |
| p2 | d2 | e2 | 120 |

R2

| ProjectID | Department | ProjectGroupsNumber |
|---|---|---|
| p1 | d1 | 5 |
| p2 | d2 | 6 |