Laboratory work 5

Task 1. Will the conversion to BCNF be dependency preserving in any case? Proof your statement and give a reasoning for choosing BCNF design.

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

Task 2. Given table in 1NF, convert to 3NF if PK is UnitID:

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| UnitId | StudentID | Date | Grade | Tutor ID |
| U1 | St1 | 23.02.03 | 4.7 | Tut1 |
| U2 | St1 | 18.11.02 | 5.1 | Tut3 |
| U1 | St4 | 23.02.03 | 4.3 | Tut1 |
| U5 | St2 | 05.05.03 | 4.9 | Tut3 |
| U4 | St2 | 04.07.03 | 5.0 | Tut5 |

|  |  |  |
| --- | --- | --- |
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| Gln | 631 | Zehnder |
| PhF | 632 | Dümmlers |
| AVQ | 621 | SwissTopo |

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

|  |  |
| --- | --- |
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| Tut3 | [tut3@fhbb.ch](mailto:tut3@fhbb.ch) |
| Tut5 | [tut5@fhbb.ch](mailto:tut5@fhbb.ch) |

Task 3. Given table in 1NF, convert to 2NF if PK is {ProjectName, ProjectManager},use decomposition:

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

|  |  |
| --- | --- |
| **ProjectName** | **ProjectManager** |
| Project1 | Manager1 |
| Project2 | Manager2 |

|  |  |  |
| --- | --- | --- |
| **ProjectManager** | Position | TeamSize |
| Manager1 | CTO | 15 |
| Manager2 | CTO2 | 12 |

|  |  |
| --- | --- |
| **ProjectName** | **Budget** |
| Project1 | 1 kk $ |
| Project2 | 1.5 kk $ |

Task 4. Given table, convert to 3NF if PK is Group, use decomposition:

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

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

|  |  |  |
| --- | --- | --- |
| GroupID | Group name | SpecialityID |
| g1 | Group1 | s1 |
| g2 | Group2 | s2 |

|  |  |  |
| --- | --- | --- |
| SpecialityID | Speciality name | FacultyID |
| s1 | Information Systems | f1 |
| s2 | Automation and Control | f1 |

|  |  |
| --- | --- |
| FacultyID | Faculty name |
| f1 | FIT |
| f2 | ISE |

Task 5. Given table, convert to BCNF if PK is {ProjectID, Department}, usedecomposition:

Curator depends on projectID and related departments, teamSize directly relates to project and

relateddepartments, ProjectGroupsNumber depends on TeamSize.

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

|  |  |  |
| --- | --- | --- |
| ProjectID | Curator | TeamID |
| p1 | e1 | T1 |
| p2 | e2 | T2 |

|  |  |  |
| --- | --- | --- |
| TeamID | Team Size | ProjectGroupsNumber |
| T1 | 100 | 5 |
| T2 | 120 | 6 |

|  |  |
| --- | --- |
| CuratorID | Department |
| e1 | d1 |
| e2 | d2 |

Task 6

The three design goals are lossless-join decompositions, dependency preserving decompositions, and minimization ofrepetition of information. They are desirable so we can maintain an accurate database, check correctness of updates quickly, and use the smallest amount of space possible.