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

BCNF can be used to obtain a lossless join decomp into 3NF but not ensure dependency preservation. It is not always possible to get a BCNF decomposition that is dependency preserving.

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

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UnitID** | **StudentID** | **Date** | **TutorID** | **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 | Gin | 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 | AVG | 621 | 5.0 | SwissTopo | tut5@fhbb.ch |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UnitID** | **StudentID** | **Date** | **TutorID** | **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 | 5.0 |

|  |  |
| --- | --- |
| **TutorID** | **TutEmail** |
| Tut1 | tut1@fhbb.ch |
| Tut3 | tut3@fhbb.ch |
| Tut1 | tut1@fhbb.ch |
| Tut3 | tut3@fhbb.ch |
| Tut5 | tut5@fhbb.ch |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Date** | **Topic** | **Room** | **TutorID** | **Book** |
| 23.02.03 | GMT | 629 | Tut1 | Deumlich |
| 18.11.02 | Gin | 631 | Tut3 | Zehnder |
| 23.02.03 | GMT | 629 | Tut1 | Deumlich |
| 05.05.03 | PhF | 632 | Tut3 | Dümmlers |
| 04.07.03 | AVG | 621 | Tut5 | SwissTopo |

**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** |
| Manager1 | CTO |
| Manager2 | CTO2 |

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

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

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

|  |  |
| --- | --- |
| **Speciality** | **Group** |
| s1 | g1 |
| s2 | g2 |

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

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

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

|  |  |
| --- | --- |
| **ProjectID** | **Curator** |
| p1 | e1 |
| p2 | e2 |

|  |  |  |
| --- | --- | --- |
| **ProjectID** | **Department** | **TeamSize** |
| p1 | d1 | 100 |
| p2 | d2 | 120 |

|  |  |
| --- | --- |
| **TeamSize** | **ProjectGroupsNumber** |
| 100 | 5 |
| 120 | 6 |

**Task 6. List the three design goals for relational databases and explain why each is desirable. Give an example of both desirable and undesirable types of decompositions.**

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