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.

Answer:

Dependency-preserving decomposition into BCNF is not always possible. Because achieving Lossless and dependency-preserving decomposition property into BCNF is difficult. And BCNF is allowed the right side of the FD to be a prime attribute.

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
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	AVQ	621	5.0	SwissTopo	tut5@fhbb.ch

Answer:

UnitID	StudentID	Date	SubjectID	Room	Grade
U1	St1	23.02.03	1	629	4.7
U2	St1	18.11.02	2	631	5.1
U1	St4	23.02.03	1	629	4.3
U5	St2	05.05.03	3	632	4.9
U4	St2	04.07.03	4	621	5.0

SubjectID	Subject	TutID
1	Subject1	Tut1
2	Subject2	Tut3
3	Subject3	Tut3
4	Subject4	Tut5

Subject	Book	Topic
Subject1	Deumlich	GMT
Subject2	Zehnder	Gln
Subject3	Dummlers	PhF
Subject4	SwissTopo	AVQ

TutorID	TutEmail
Tut1	Tut1@fhbb.ch
Tut3	Tut3@fhbb.ch
Tut5	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

Answer:

ProjectName	ProjectManager
Project1	Manager1
Project2	Manager2

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

ProjectManager	Position
Manager1	CTO
Manager2	CTO2

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	Specialty
g1	f1	s1

g2	f2	s2

Answer:

Group	Specialty
G1	S1
G2	S2
G3	S1
G4	S3

Specialty	Faculty
S1	F1
S2	F2
S3	F1

Faculty	FacultyName
F1	FIT
F2	BS

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

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

Answer:

ProjectID	Curator	TeamSize
p1	e1	100
p2	e2	120

Curator	Department
e1	d1
e2	d2

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.

Answer:

The three design goals are lossless-join decompositions, dependency preserving decompositions, and minimization of repetition of information.

Lossless-join decompositions is the ability to ensure that any instance of the original relation can be identified from corresponding instances in the smaller relations.

If decomposition is not dependency-preserving, some dependency is lost in the decomposition.

Minimization of repetition of decomposition reduces unnecessary duplication of information