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

dept_advisor(s_ID, i_ID, department_name)

With function dependencies:

$i\_ID \rightarrow dept\_name$

$s\_ID, dept\_name \rightarrow i\_ID$

dept_advisor is not in BCNF

i_ID is not a superkey.

Any decomposition of *dept_advisor* will not include all the attributes in

$s\_ID, dept\_name \rightarrow i\_ID$

Thus, the composition is NOT be dependency preserving

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	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

UnitID	StudentID	Date	Tutor ID	Grade	Book
U1	St1	23.02.03	Tut1	4.7	Deumlich
U2	St1	18.11.02	Tut3	5.1	Zehnder
U1	St4	23.02.03	Tut1	4.3	Deumlich
U5	St2	05.05.03	Tut3	4.9	Dümmlers
U4	St2	04.07.03	Tut5	5.0	SwissTopo

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

Book	UnitID	Topic
Deumlich	U1	GMT
Zehnder	U2	Gln
Deumlich	U1	GMT
Dümmlers	U5	PhF
SwissTopo	U4	AVQ

Date	Room
23.02.03	629
18.11.02	631
05.05.03	632
04.07.03	621

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**	**Budget**
Project1	Manager1	1 kk $
Project2	Manager2	1.5 kk $

ProjectManager	Position
Manager1	CTO
Manager2	CTO2

ProjectName	TeamSize
Project1	15
Project2	12

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

Group	Speciality
g1	s1
g2	s2

Speciality	Faculty
s1	f1
s2	f2

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	TeamSizeID
p1	d1	e1	1
p2	d2	e2	2

TeamSizeID	TeamSize	ProjectGroupsNumber
1	100	5
2	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 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