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

Every conversion into BCNF may not be dependency preserving.

proof: We only need to give a counter example: Consider the following schema;

a b c and c->b

Clearly the above schema is in 3NF, because ab->c is a superkey dependency and ,from c->b we can see that b-c=b, which is a subset of the primary key (such dependency is also allowed in 3NF).

But, the above schema is not in BCNF because c->b is neither super-key nor trivial dependency.

So we decompose above schema , keeping it lossless.

Only possible lossless decomposition is: ac and cb. (because, their intersection c is primary key for the 2n table).

But clearly the dependency ab->c is lost.

Task 2.

UnitID	TutorID	Topic	Room	Date
U1	Tut1	GMT	629	23.02.03
U2	Tut3	Gln	631	18.11.02
U5	Tut3	PhF	632	05.05.03
U4	Tut5	AVQ	621	04.07.03

StudentID	Grade	UnitID
St1	4.7	U1
St1	5.1	U2
St4	4.3	U1
St2	4.9	U5
St2	5.0	U4

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

Topic	Book
GMT	Deumlich
Gln	Zehnder
PhF	Demmlers
AVQ	SwissTopo

Task 3.

ProjectName (PK)	Budget
Project1	1 kk $
Porject2	1.5 kk $

ProjectManager (PK)	Position	TeamSize
Manager1	CTO	15
Manager2	CTO2	12

ProjectName (PK)	ProjectManager (PK)
Project1	Manager1
Project2	Manager2

Task 4.

Group	Specialty
G1	S1
G2	S2

Specialty	Faculty
S1	F1
S2	F2

Task 5.

ProjectID (PK)	Curator	TeamSize
p1	e1	100
p2	e2	120

ProjectGroupsNumber (PK)	TeamSize (FK)
5	100
6	120

ProjectID (PK)	Deparment (PK)
p1	d1
p2	d2

Task 6.

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