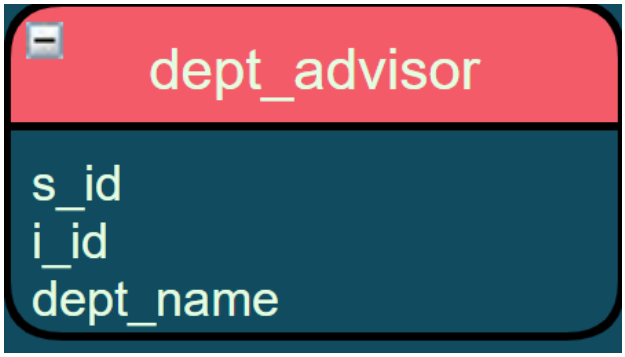
1.

It is not always possible to achieve both BCNF and dependency preservation.



Function dependencies:

i_id → dept_name

s_id, dept_name → i_id

Any decomposition will not preserve s_id, dept_name → i_id functional dependent.

2.

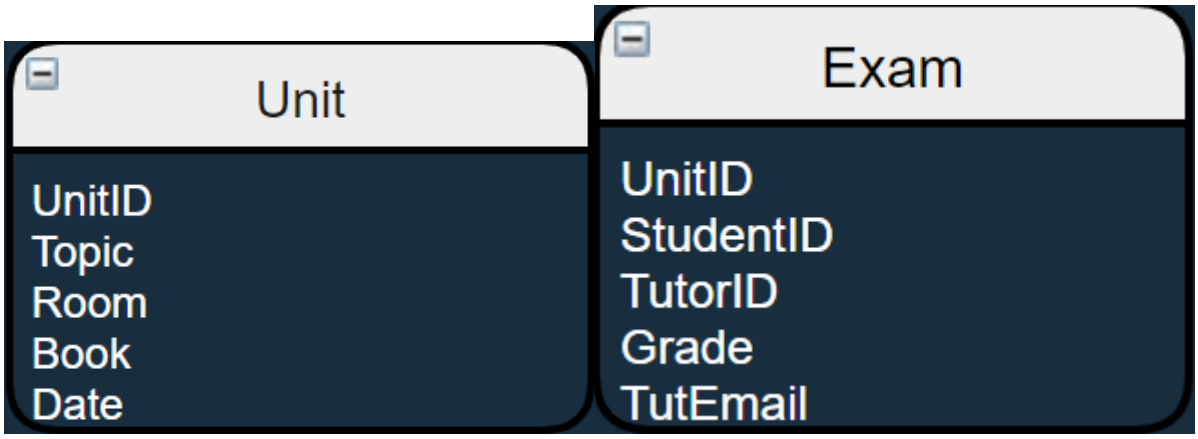
UnitID	StudentID	Date	Tutor ID	Topic	Room	Grade	Book	TutEmail
U1	St1	23.02.03	Tut1	GMT	629	4.7	Deumlich	tut1@fhbb.ch
U2	St1	18.11.02	Tut3	GIn	631	5.1	Zehnder	tut3@fhbb.ch
U1	St4	23.02.03	Tut1	GMT	629	4.3	Deumlich	tut1@fhbb.ch
U5	St2	05.05.03	Tut3	PhF	632	4.9	Dümmlers	tut3@fhbb.ch
U4	St2	04.07.03	Tut5	AVQ	621	5.0	SwissTopo	tut5@fhbb.ch

To get this table to 3NF, first we have to convert it to 2NF.

We have primary key (UnitID, StudentID), but Topic, Room, Book, Date only depends on UnitID:

UnitID → Topic, Room, Book, Date

That's why we have partial dependency. To fix it we should decompose this table to:

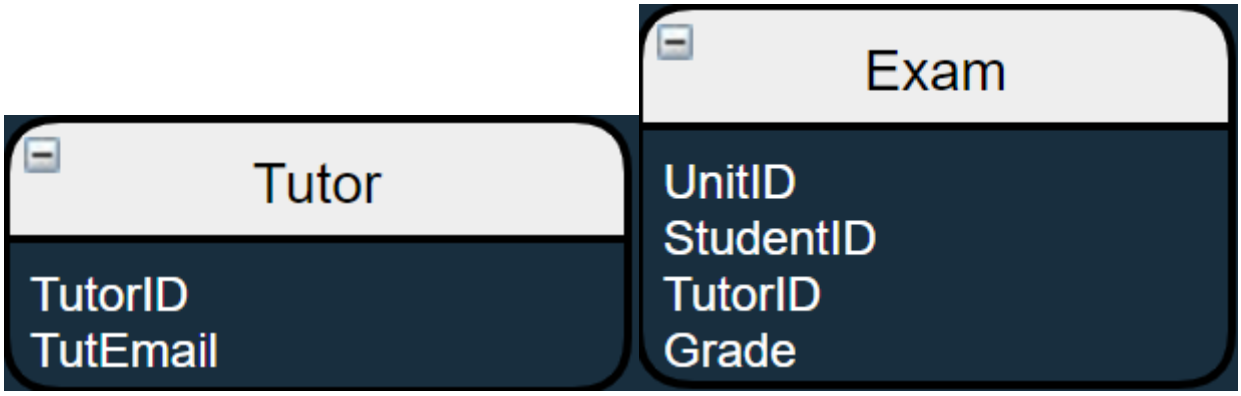


Now our table in the 2NF.

We can see that TutEmail depends only on the TutorID, but TutorID and TutEmail are non-prime attributes:

TutorID → TutEmail

This is Transitive Dependence, we have to get rid of it to get our table in 3NF, also we can do it by decomposing our table:



Now our table in 3NF

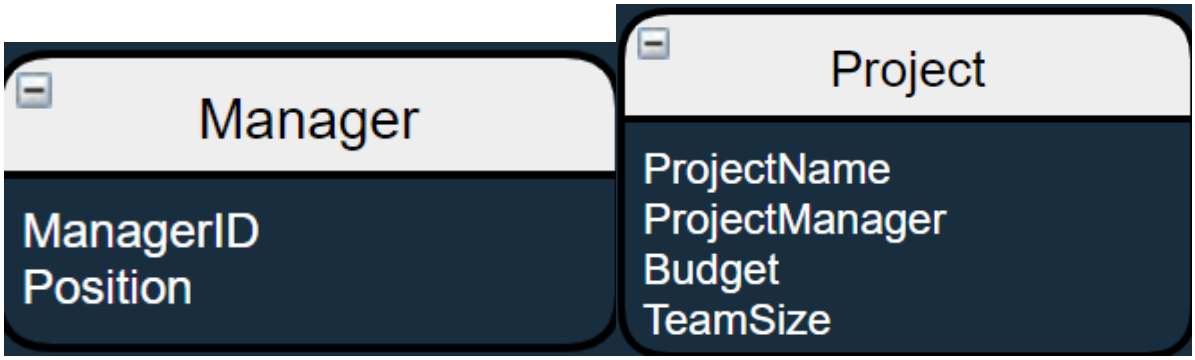
3.

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

We have primary key (ProjectName, ProjectManager). Attribute Position depends on only ProjectManager:

ProjectManager → Position

This is partial dependency, we have to delete it by decomposition:



Now our table in 2NF.

4.

Group	Faculty	Speciality
g1	f1	s1
g2	f2	s2

To get our table to 3NF we have to delete the Transitive Dependence. Speciality depends on the Faculty:

Faculty → Speciality

Decomposing gives us: