SNS COLLEGE OF TECHNOLOGY,COIMBATORE-35

(AN AUTONOMOUS INSTITUTION)

DEPARTMENTOFCOMPUTERSCIENCEANDENGINEERING

23CST201-DATABASE MANAGEMENT SYSTEMS

UNIT-III

DatabaseDesign

Topic:2NFand3NF

Fourthnormalform(4NF)

- Arelationwillbein4NFifitisinBoyceCoddnormalformandhasno multi-valued dependency.
- ForadependencyA→B,ifforasinglevalueofA,multiplevaluesofB exists, then the relation will be a multi-valued dependency.

Example

STUDENT

STU_ID	COURSE	HOBBY
21	Computer	Dancing
21	Math	Singing
34	Chemistry	Dancing
74	Biology	Cricket
59	Physics	Hockey

The given STUDENT table is in 3NF, but the COURSE and HOBBY are two independent entity. Hence, there is no relationship between COURSE and HOBBY.

In the STUDENT relation, a student with STU_ID, **21** contains two courses, **Computer** and **Math** and two hobbies, **Dancing** and **Singing**. So there is a Multi-valued dependency on STU_ID, which leads to unnecessary repetition of data.

So to make the above table into 4NF, we can decompose it into two tables:

STUDENT_COURSE

STU_ID	COURSE
21	Computer
21	Math
34	Chemistry
74	Biology
59	Physics

STUDENT_HOBBY

STU_ID	HOBBY
21	Dancing
21	Singing
34	Dancing

74	Cricket
59	Hockey

Fifthnormalform(5NF)

- Arelation is in5NF ifit is in4NFand not contains anyjoindependencyand joining should be lossless.
- 5NFissatisfiedwhenallthetablesarebrokenintoasmanytablesas possible in order to avoid redundancy.
- 5NFisalsoknownasProject-joinnormalform(PJ/NF).

Example

SUBJECT	LECTURER	SEMESTER
Computer	Anshika	Semester 1
Computer	John	Semester 1
Math	John	Semester 1
Math	Akash	Semester 2
Chemistry	Praveen	Semester 1

Inthe above table, Johntakes bothComputer and Mathclass for Semester 1 but he doesn't take Math class for Semester 2. In this case, combination of all these fields required to identify a valid data.

Suppose we add a new Semester as Semester 3 but do not know about the subject and who will be taking that subject so we leave Lecturer and Subject as NULL.But all three columns together acts as a primary key, so we can't leave other two columns blank.

So to make the above table into 5NF, we can decompose it into three relations P1, P2 & P3:**P1**

SEMESTER	SUBJECT
Semester1	Computer
Semester 1	Math
Semester 1	Chemistry
Semester 2	Math

P2

SUBJECT	LECTURER
Computer	Anshika
Computer	John
Math	John
Math	Akash
Chemistry	Praveen

P3

SEMSTER	LECTURER
Semester 1	Anshika
Semester 1	John

Semester 1	John
Semester 2	Akash
Semester 1	Praveen