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BA/DA Training

Assignment 10

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**Boyce and codd normal form (BCNF):**

It is an advance version of 3NF, so it is also referred as 3.5NF. A 3NF table that doesn’t have multiple overlapping candidate keys is said to be in BCNF. For a table to satisfy the Boyce-Codd Normal Form, it should satisfy the following two conditions:

1. It should be in the Third Normal Form.
2. And, for any dependency A → B, A should be a super key.

It means, that for a dependency A → B, A cannot be a non-prime attribute, if B is a prime attribute.

Table:

|  |  |  |
| --- | --- | --- |
| Student\_ID | Subject | Professor |
| 101 | Java | P.Java |
| 101 | C++ | P.Cpp |
| 102 | Java | P.Java2 |
| 103 | C# | P.Chash |
| 104 | Java | P.Java |

In the table above:

* One student can enroll for multiple subjects. For example, student with Student\_ID 101, has opted for subjects - Java & C++
* For each subject, a professor is assigned to the student.
* And, there can be multiple professors teaching one subject like we have for Java.

In the table above Student\_ID, subject together form the primary key, because using Student\_ID and subject, we can find all the columns of the table. One professor teaches only one subject, but one subject may have two different professors so, there is a dependency between subject and professor here, where subject depends on the professor name.

This table satisfies the 1st Normal form because all the values are atomic, column names are unique and all the values stored in a particular column are of same domain.

This table also satisfies the 2nd Normal Form, as there is no Partial Dependency.

And, there is no Transitive Dependency; hence the table also satisfies the 3rd Normal Form. But this table is not in Boyce-Codd Normal Form. In the table above, Student\_ID, subject form primary key, which means subject column, is a prime attribute. But, there is one more dependency, professor → subject. And while subject is a prime attribute, professor is a non-prime attribute, which is not allowed by BCNF.

To make this relation satisfy BCNF, we need to decompose this table into two tables, student table and professor table.

Student table:

|  |  |
| --- | --- |
| Student\_ID | P\_ID |
| 101 | 1 |
| 101 | 2 |

And so on…

Professor Table:

|  |  |  |
| --- | --- | --- |
| P\_ID | Professor | Subject |
| 1 | P.Java | Java |
| 2 | P.Cpp | C++ |

And so on….

And now, this relation satisfies Boyce-Codd Normal Form.