Transition from 3NF to BCNF:

Overview of BCNF:

To transition a schema from **3NF** to **BCNF** (Boyce-Codd Normal Form), we must ensure that for every functional dependency in a table, the left-hand side of the dependency (the determinant) is a **superkey**. A **superkey** is any set of attributes that can uniquely identify a record in a table.

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1. Identification of BCNF Violations:

In our schema, after achieving **3NF**, the next step is to verify if all functional dependencies have **superkeys** on the left-hand side. A table is in **BCNF** if and only if for every non-trivial functional dependency, the determinant is a superkey.

Step-by-Step Analysis:

1. User Table:

- **Primary Key**: user_id
- Functional dependencies:
  - user_id → (first_name, last_name, age, role, email)
- Since user_id is the primary key, this table satisfies **BCNF**.

2. College Table:

- **Primary Key**: college_id
- Functional dependencies:
  - college_id → (name, location)
- Since college_id is the primary key, this table satisfies **BCNF**.

3. Super_Admin Table:

- **Primary Key**: admin_id
- Functional dependencies:
  - admin_id → (first_name, last_name, email, password, designation, college_id)
- Since admin_id is the primary key, this table satisfies **BCNF**.

4. Club Table:

- **Primary Key**: club_id
- Functional dependencies:
  - club_id → (name, email, category, secretary_id, college_id)
  - secretary_id → secretary_name (However, this dependency was resolved in 3NF by removing the secretary_name column from the Club table.)

- As the remaining dependencies in the table are on the primary key (club_id) and foreign keys referencing other tables, this table satisfies **BCNF**.

5. Event Table:

- **Primary Key**: event_id
- Functional dependencies:
  - event_id → (name, type_of_event, date, location, status, organised_BY, max_num_of_participants)
  - organised_BY → (club_id) (via foreign key organised_BY referencing Club(club_id))
- Since event_id is the primary key, this table satisfies **BCNF**.

6. Competition Table:

- **Primary Key**: comp_id
- Functional dependency:
  - comp_id → (name, type_of_comp, date, venue, event_id)
- Since comp_id is the primary key, this table satisfies **BCNF**.

7. Transaction Table:

- **Primary Key**: trans_id
- Functional dependency:
  - trans_id → (amount, description, trans_type, transferred_to)
  - transferred_to → (club_id) (via foreign key transferred_to referencing Club(club_id))
- Since trans_id is the primary key, this table satisfies **BCNF**.

8. Registers Table:

- **Primary Key**: reg_id
- Functional dependencies:
  - reg_id → (user_id, event_id)
  - user_id → user_details (since we know user details are already in the User table, this is not problematic.)
- Since reg_id is the primary key, this table satisfies **BCNF**.

9. Requests_Approval Table:

- **Primary Key**: request_id
- Functional dependencies:
  - request_id → (club_id, source, status, approved_by, rejected_by)
- Since request_id is the primary key, this table satisfies **BCNF**.

10. Feedback Table:

- **Primary Key**: feedback_id
- Functional dependency:
  - feedback_id → (event_id, user_id, time, rating, comment)
- Since feedback_id is the primary key, this table satisfies **BCNF**.

Conclusion:

After analyzing all the tables in the schema, we see that **all of them satisfy BCNF**. There are no violations where a non-superkey determines other attributes. Hence, the schema is already in **BCNF**.