Normalization of Employee Table

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Why do we need Normalization?

Considering this Example

EMPLOYEE

(EID, NAME, AGE, SALARY, BASIC, HRA, TA, DA, PF, DESIGNATION, DEPARTMENT, HOD)

Problems

1. HRA, TA, DA, PF all depend on the BASIC Salary.

2. The Total Salary need not be stored, since it can be summed up from the components.

3. The Designation, Department & HOD would be redundant.

These problems can be fixed using a set of Rules which are to be followed to allow for a more efficient storage and retrieval of data known as Normalization.

First Normal Form (1NF) – Ensure Atomicity & Uniqueness

Conditions required for 1NF

- <u>Atomicity:</u> Each column contains only **single, indivisible** values

- <u>Uniqueness:</u> Each row has a **unique identifier (Primary Key)**.

Example of Violations:-

Full Address, Alternate Phone Numbers, Salary (in words & in digits)

For Our Case:- EMPLOYEE (EID, NAME, AGE, SALARY, BASIC, HRA, TA, DA,

PF, DESIGNATION, DEPARTMENT, HOD)

All columns contain single value and consistent datatype. So it's already in 1NF.

Second Normal Form (2NF) – Eliminate Partial Dependencies

Conditions required for 2NF

- It is already in **1NF**.

- All non-key attributes fully depend on the entire Primary Key(no partial dependency).

For Our Case:- EMPLOYEE (EID, NAME, AGE, SALARY, BASIC, HRA, TA, DA,

PF, DESIGNATION, DEPARTMENT, HOD)

Since HRA, TA, DA, PF doesn't depend on the EID only, It depends on the BASIC Salary too. It can be moved to another table where it will be only dependent on the Primary Key (Basic Salary) only.

SALARY_COMPONENTS(BASIC, TA, HRA, DA, PF)

3rd Normal Form (3NF) – Remove Transitive Dependencies

Conditions required for 3NF

- Must be in **2NF**.

- **No transitive dependency** (i.e., non-key attributes should not depend on other non-key attributes).

For Our Case:- EMPLOYEE (EID, NAME, AGE, BASIC, DESIGNATION, DEPARTMENT, HOD)

Here we clearly have the HOD directly dependent on the Department & the Department being dependent on the EID. So we have a case of Transitive Dependency.

DEPARTMENT(DEPT_ID,DEPT_NAME,HOD)

By creating a new DEPARTMENT Table we successfully satisfy the conditions of 3NF

4th Normal Form (4NF) – Remove Multi-Valued Dependencies

Conditions required for 4NF

- Must be in **3NF**.

- **No multi-valued dependencies** (MVD) where a column has **multiple independent values** for a single key.

For Our Case:- Since we have multiple employees with same Designation, that itself can be normalized into a separate DESIGNATION TABLE.

EMPLOYEE (EID, NAME, AGE, BASIC, DESIG_ID)

SALARY(BASIC, HRA, TA, DA, PF)

DESIGNATION(DESIG_ID, DESIG_NAME, DEPT_ID)

DEPARTMENT(DEPT_ID,DEPT_NAME,HOD)

Final ER Diagram