WISSEN
TECHNOLOGY

Normalization in DBMS

Process of organizing data to eliminate redundancy and improve data integrity

Start Slide

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1NF (First Normal Form)

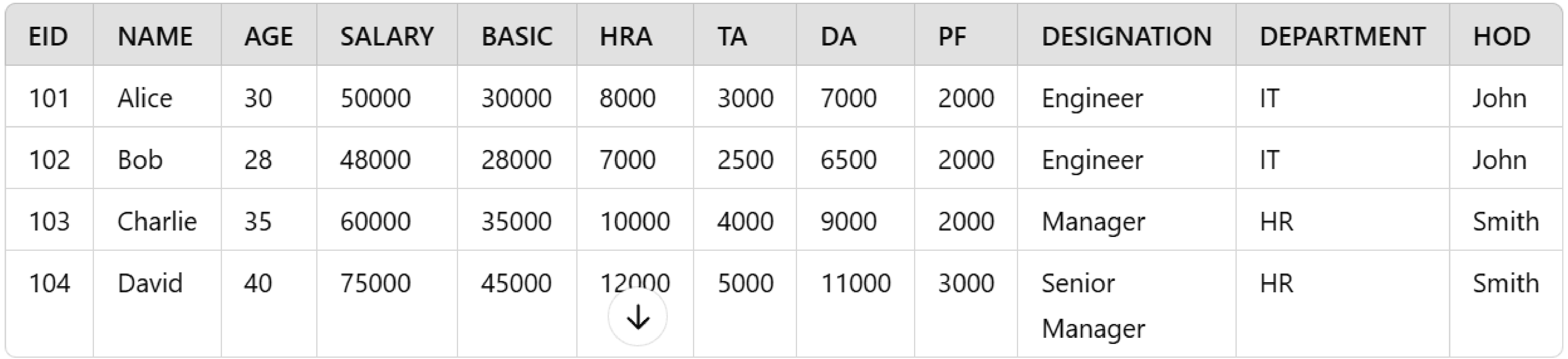
Eliminate repeating groups; all values must be atomic (indivisible).

Rules

- Ensure atomicity (each column contains indivisible values).
- Each row must have a unique identifier (Primary Key).

Table

✓ The table is already in 1NF, as each column contains atomic values.



EID	NAME	AGE	SALARY	BASIC	HRA	TA	DA	PF	DESIGNATION	DEPARTMENT	HOD
101	Alice	30	50000	30000	8000	3000	7000	2000	Engineer	IT	John
102	Bob	28	48000	28000	7000	2500	6500	2000	Engineer	IT	John
103	Charlie	35	60000	35000	10000	4000	9000	2000	Manager	HR	Smith
104	David	40	75000	45000	12000	5000	11000	3000	Senior Manager	HR	Smith

2NF (Second Normal Form)

Every non-key attribute must depend on the whole primary key, not just part of it.

Rules

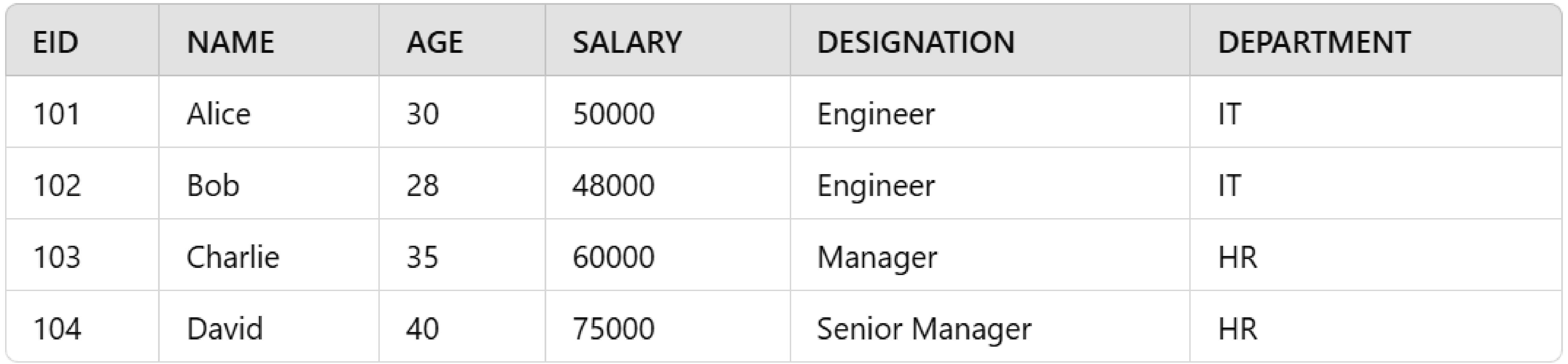
- ✓ Must be in 1NF.
- ✓ No Partial Dependency: Every non-key column must depend on the entire primary key.

Identifying Dependencies

- EID → Name, Age, Salary, Basic, HRA, TA, DA, PF, Designation, Department
- Department → HOD (Each department has a unique HOD)

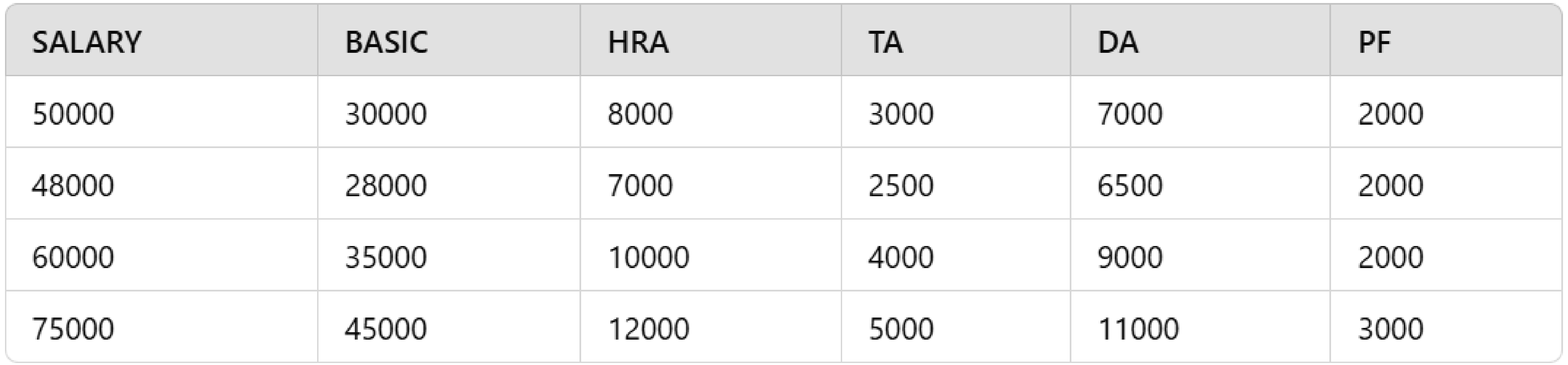
Solution: Breaking into Three Tables

EMPLOYEE Table



EID	NAME	AGE	SALARY	DESIGNATION	DEPARTMENT
101	Alice	30	50000	Engineer	IT
102	Bob	28	48000	Engineer	IT
103	Charlie	35	60000	Manager	HR
104	David	40	75000	Senior Manager	HR

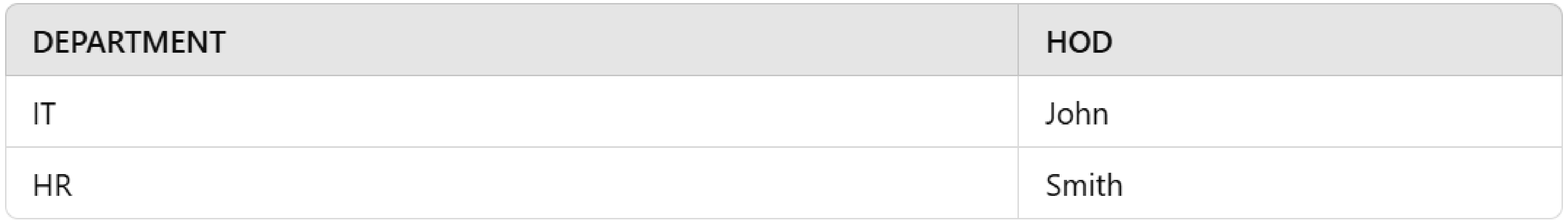
SALARY Table



SALARY	BASIC	HRA	TA	DA	PF
50000	30000	8000	3000	7000	2000
48000	28000	7000	2500	6500	2000
60000	35000	10000	4000	9000	2000
75000	45000	12000	5000	11000	3000

Solution: Breaking into Three Tables

DEPARTMENT Table



DEPARTMENT	HOD
IT	John
HR	Smith

✓ Now, all non-key columns depend on the entire primary key, and no partial dependency exists.

3NF (Third Normal Form)

Non-key attributes should depend only on the primary key & not on another non-key attribute.

Rules

- ✓ Must be in 2NF.
- ✓ No Transitive Dependency: Non-key attributes should not depend on other non-key attributes.

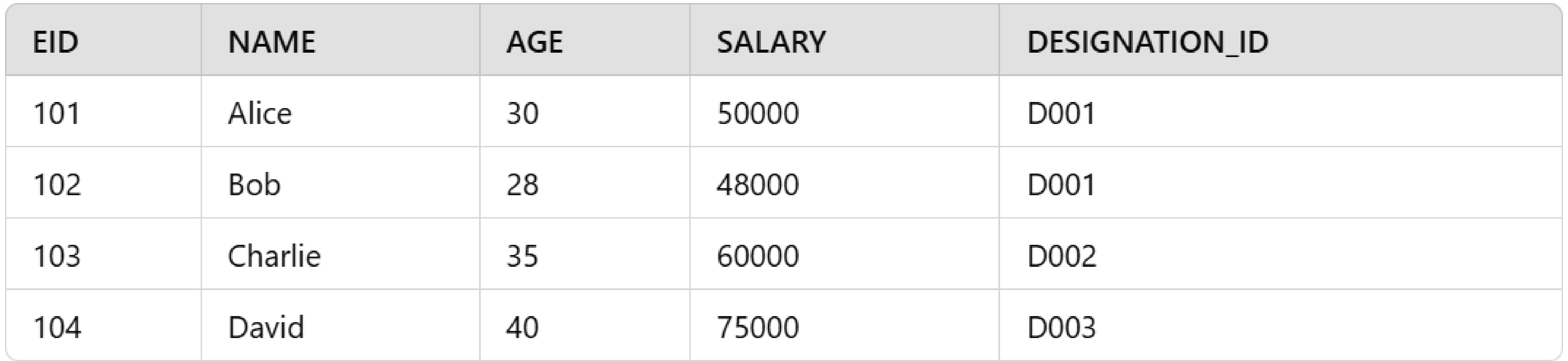
Identifying Dependencies

- ● Salary → Basic, HRA, TA, DA, PF (Resolved)
- ● Department → HOD (Resolved)
- ● Designation → Department (Issue)

Problem: If a designation is always associated with a department, we have a transitive dependency.

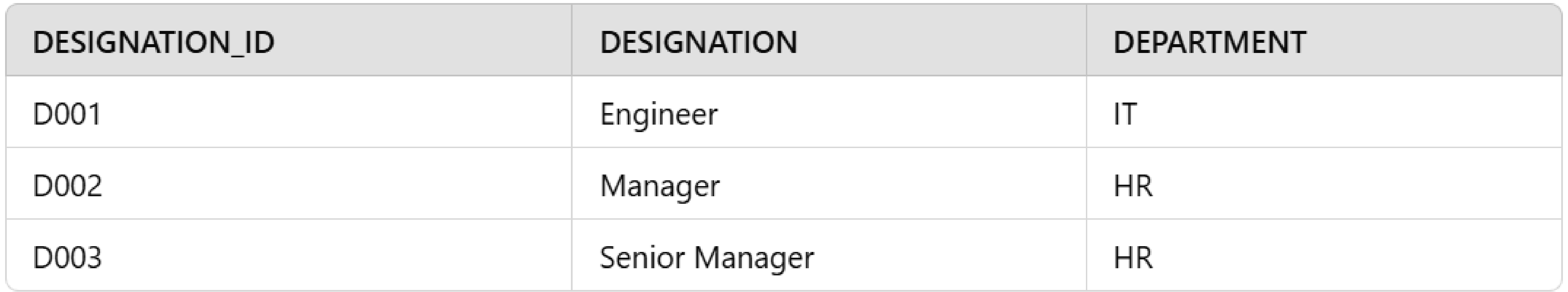
Solution: Separate this dependency.

EMPLOYEE Table (Updated)



EID	NAME	AGE	SALARY	DESIGNATION_ID
101	Alice	30	50000	D001
102	Bob	28	48000	D001
103	Charlie	35	60000	D002
104	David	40	75000	D003

DESIGNATION Table



DESIGNATION_ID	DESIGNATION	DEPARTMENT
D001	Engineer	IT
D002	Manager	HR
D003	Senior Manager	HR

✓ No transitive dependency exists.

BCNF (Boyce-Codd Normal Form)

Every determinant (an attribute that determines another attribute) must be a candidate key.

Rules

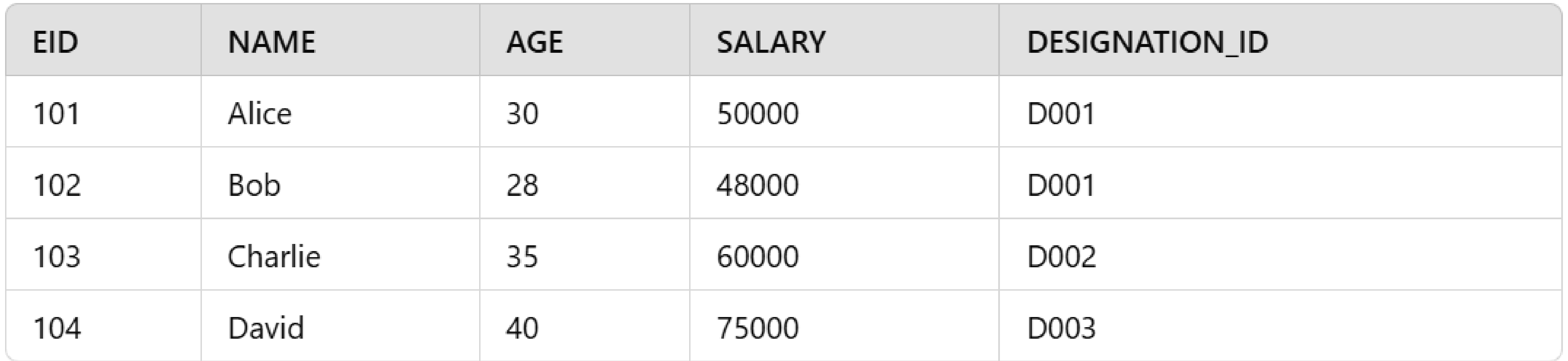
- ✓ Must be in 3NF.
- ✓ Every determinant must be a candidate key.

Identifying Dependencies

- Designation → Department
  - Not all designations uniquely determine a department (e.g., Engineers may belong to IT and HR).
  - This is not an issue in our case since we've already split them properly.

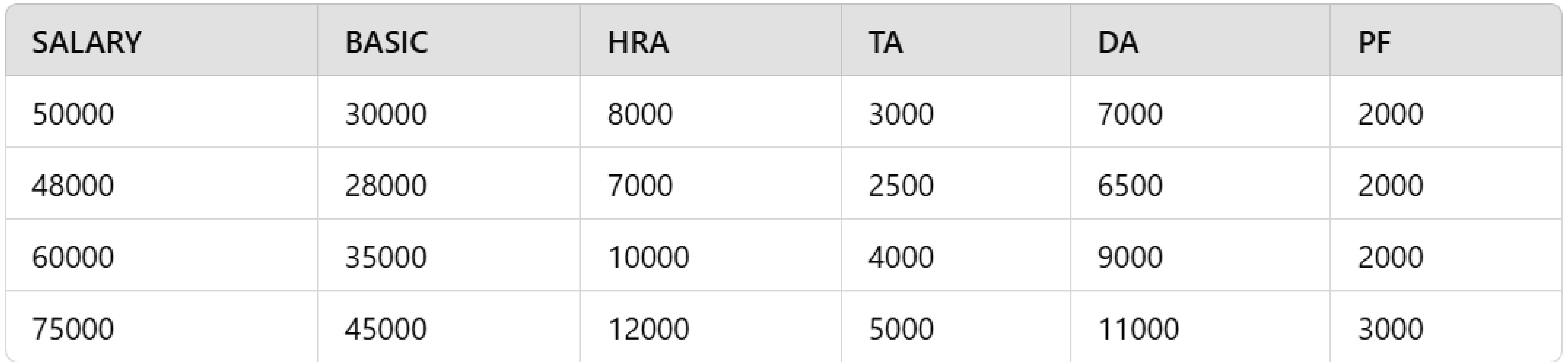
Final Normalized Schema

EMPLOYEE Table



EID	NAME	AGE	SALARY	DESIGNATION_ID
101	Alice	30	50000	D001
102	Bob	28	48000	D001
103	Charlie	35	60000	D002
104	David	40	75000	D003

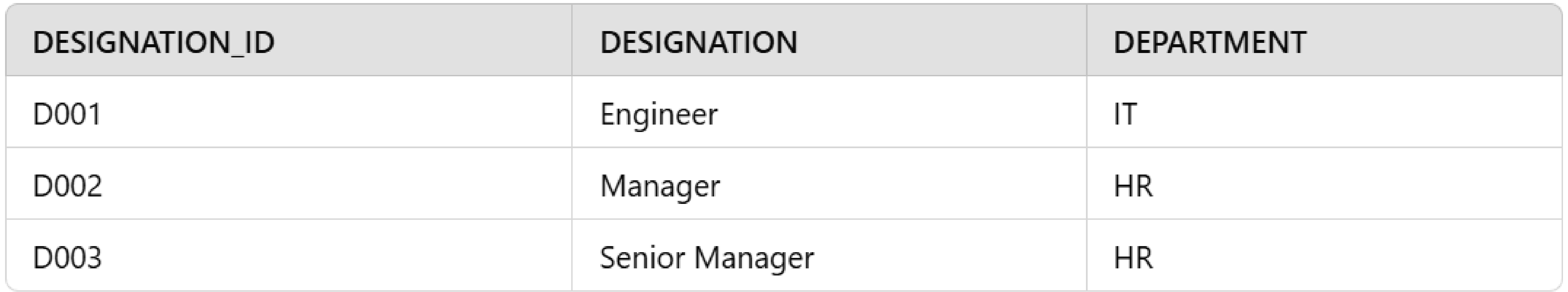
SALARY Table



SALARY	BASIC	HRA	TA	DA	PF
50000	30000	8000	3000	7000	2000
48000	28000	7000	2500	6500	2000
60000	35000	10000	4000	9000	2000
75000	45000	12000	5000	11000	3000

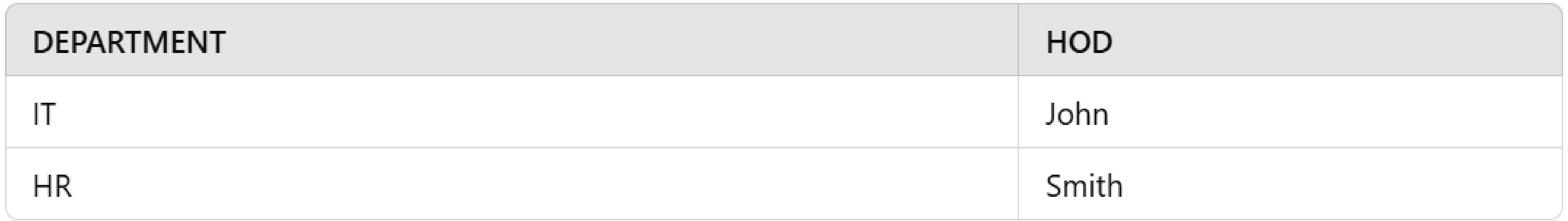
Final Normalized Schema

DESIGNATION Table



DESIGNATION_ID	DESIGNATION	DEPARTMENT
D001	Engineer	IT
D002	Manager	HR
D003	Senior Manager	HR

DEPARTMENT Table



DEPARTMENT	HOD
IT	John
HR	Smith

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THANK YOU