

- ✓ QLB, QBE, Structured query language - with special reference of (SQL of ORACLE), integrity constraints, functional dependencies and Normalisation - (upto 4<sup>th</sup> Normal forms), BCNF (Boyce-odd Normal Forms)

### query language:-

• query language refers to any computer programming language that requests and retrieves data from database and information systems by sending queries.

• It works on user entered Structured and formal programming command based queries to find and extract data from host database.

• query language is primarily created for creating, accessing, and modifying data in and out from DBMS.

• Typically, Query language requires users to input a structured command that is similar and close to English language querying constructs.

for eg → the SQL query language.

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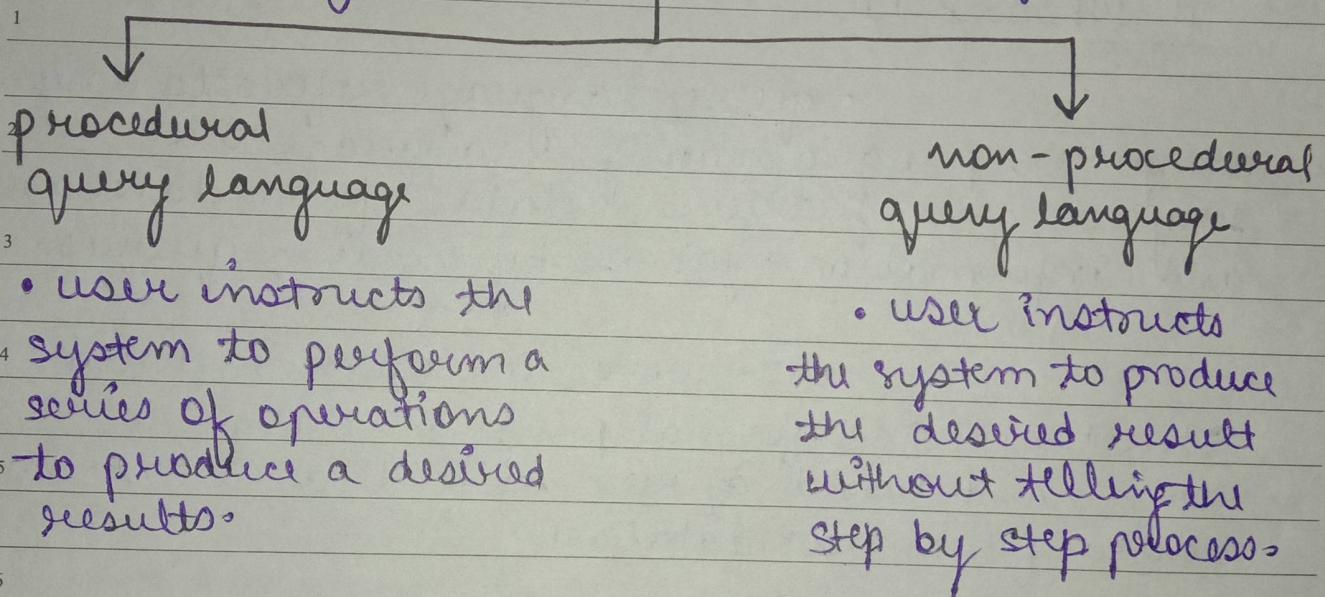
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- 9     • So, query language is a language in which user requests information from Database  
 10    eg: SQL.

- 11     • query = "retrieval program".

- 12     • There are two types of query language are as follows:-



- 3     • user instructs the system to perform a series of operations to produce a desired results.

- user instructs the system to produce the desired result without telling the step by step process.

- 6     • user tells what data to be retrieved from database and how to retrieve it.

- user tells what data to be retrieved from database but doesn't tell how to retrieve it.

- it is a type of relational algebra.

- it is a type of <sup>NOTES</sup> relational calculus.

October '21

Su	Mo	Tu	We	Th	Fr	Sa
31				1	2	
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8	9	10	11	12	13	14
15	16	17	18	19	20	21
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Tomorrow never comes, it is always today. - Osho

9     • query by example (QBE) :-

10     • if we talk about normal  
 11     queries we fire on the database they should be  
 12     correct and in a well defined structure which  
 means they should follow a proper syntax or  
 if the syntax is wrong definitely we will get an  
 error & and due to that our calculation  
 definitely going to stop.

2     • so to overcome this problem QBE  
 3     was introduced • QBE stand by "Query by  
 example" and it was developed in 1970 by  
 Moshe Zloof at IBM.

4     • it is a graphical query language  
 5     where we get a user interface and then we  
 6     will fill some required fields to get our  
 proper result.

7     → in SQL, we will get an error if the  
 query is not correct but in the case of QBE  
 if the query is wrong either we get a wrong  
 answer or the query will not be going to  
 execute but we will never get any error.

## NOTES

• in QBE, we don't write complete queries like SQL or other database languages  
 it comes with some blank so we need to fill those blanks and we'll get our required result.

Start each day with a positive thought and a grateful heart. - Roy T. Bennett

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07

THURSDAY

October '21

Week-41 (280-085)

Octob  
Week-42

Points → QBE is supported by most of the  
database programs.

→ it is graphical query language.

→ it is created in parallel to SQL development.

12 • SQL :-

• SQL stands for Structured query language.

• SQL is a non-procedural in nature.

The SQL standard specifies data definition, data manipulation and other associated facilities of a DBMS that supports the relational data model.

• SQL is a comprehensive language for controlling and interacting with a DBMS.

• This language was named as the Structured English query language (SEQUEL) the name later was shortened to Structured query language (SQL).

↓ Role of SQL

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- It is an interactive language because the user gains access to the data by issuing desired query.

Either you run the day, or the day runs you. - Jim Rohn

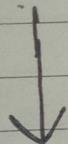
query

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- This provides a convenient, easy to use for database query.

• It is a database programming language because SQL commands can easily be embedded into application programs to access the data from a database.

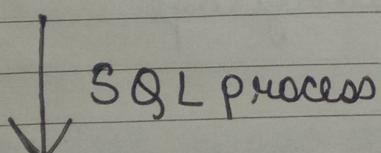
→ whereas RDBMS is a relational database management system where data is stored in the form of tables, which contains rows and columns.



what can SQL do?

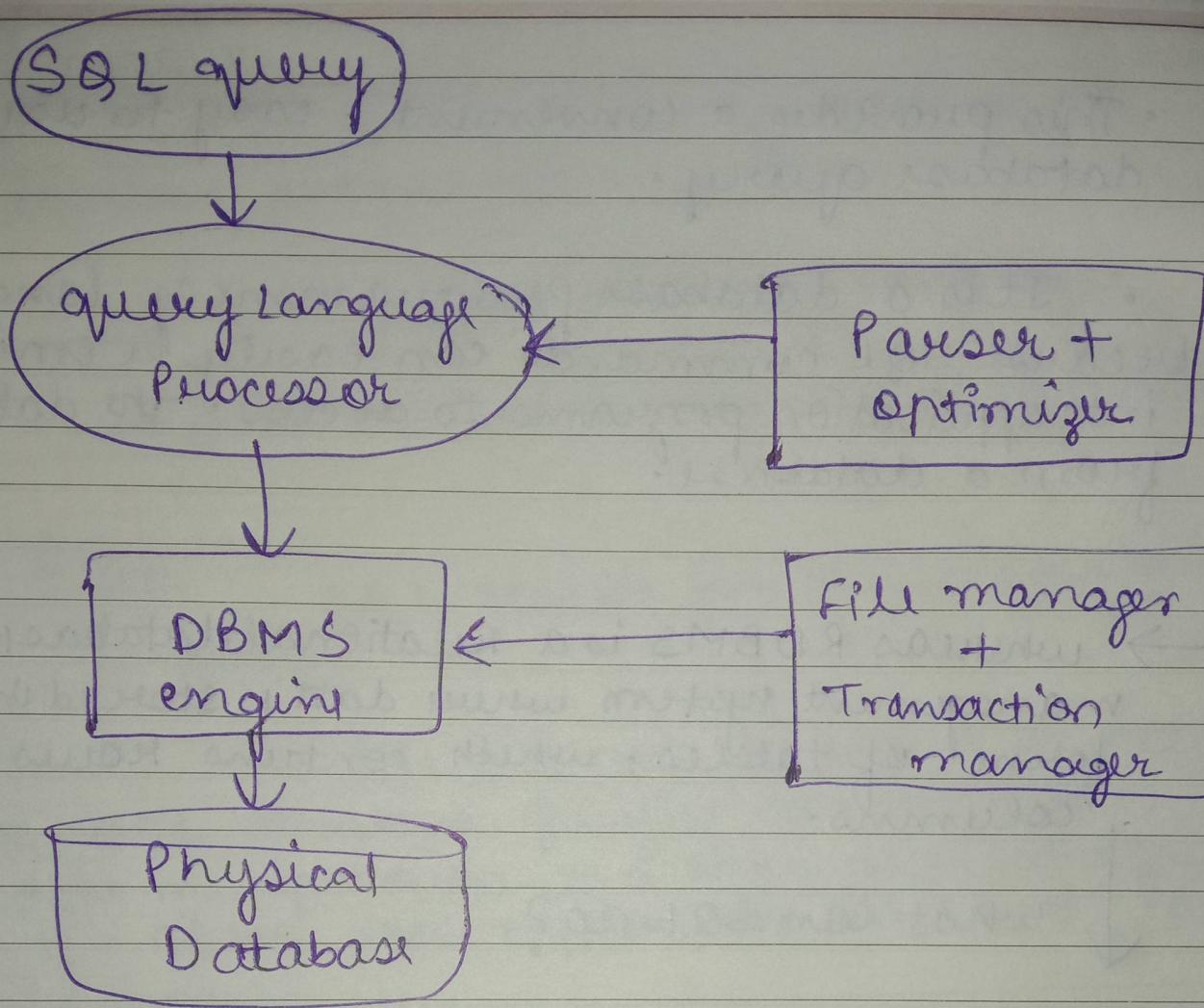
- SQL can execute queries against a database.
- SQL can retrieve data from a database.
- SQL can insert records in a database.
- SQL can update records in a database.
- SQL can delete records from a database.
- SQL can create new database, new tables in a database.
- SQL can create views in a database.

NOTES



I will prepare and some day my chance will come. - Abraham Lincoln

November '21						
Su	Mo	Tu	We	Th	Fr	Sa
1	2	3	4	5	6	
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## ↓ advantages of SQL

- High speed
- no coding needed
- portability
- multiple data view
- well defined standards
- easy to learn & use

October '21

Su	Mo	Tu	We	Th	Fr	Sa
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• interactive language

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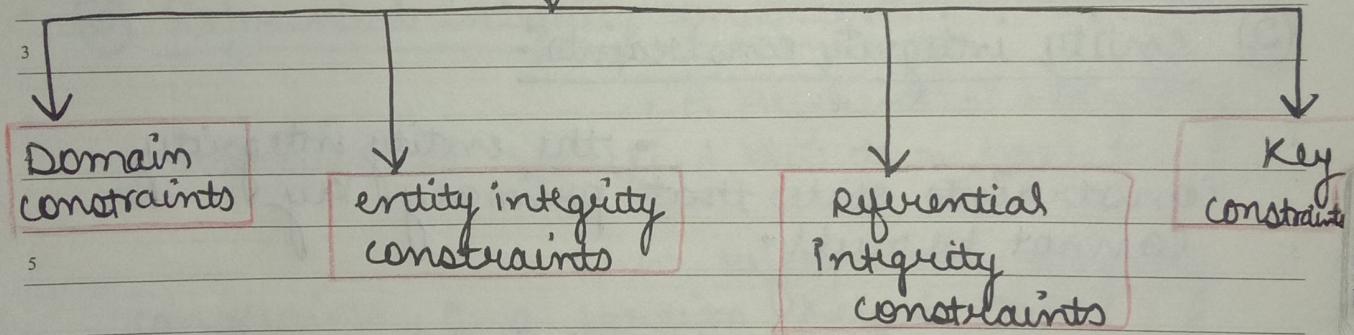
→ now, write about SQL commands.  
and its types.

## 9. • integrity constraints:-

10. • integrity constraints are a set  
11. of rules. It is used to maintain the quality  
of information.

12. • It ensures that the data insertion,  
13. updating and other processes have to be performed  
1. in such a way that data integrity is not affected.

### 2. Types



### ① Domain constraints:

7. • Domain constraints  
can be defined as the definition of a valid set  
of values for an attribute.

• The data type of domain

NOTES includes string, character,  
integer, time, date, etc.

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22	23	24	25	26	27	28

• The values of the attributes  
must be available in the corresponding domain.

Live each day as if your life had just begun. - Johann Wolfgang Von Goethe

14

THURSDAY

October '21  
Week-42 (287-07B)

eg:-

ID	Name	Age
101	Aman	20
102	Arun	(A)
103	1 X	30
104	Karan	35

not allowed  
because age  
is an integer  
attribute.

→ not allowed  
because name  
is an string  
attribute.

## ② entity integrity constraints:

- the entity integrity constraints states that primary key cannot be null.

- This is because the primary key value is used to identify individual rows in relation and if the primary key has a null value, then we can't identify those rows.

- A table can contain a null value other than the primary key field.

→ foreg:-

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NOTES

	emp-Id	emp - Name	Salary
9	123	Kamal	30000
10	345	Karan	40000
11	567	Arun	30000
	NULL	Ram	50000

not allowed as primary key can't contain a NULL value.

→ define foreign key constraints.

### ③ Referential integrity constraints:

• A referential integrity constraint is specified b/w two tables.

• In referential integrity constraints, if a foreign key in Table 1 refers to the primary key on Table 2, then every value of the foreign key in Table 1, must be null or be available in Table 2.

eg:-

E-NO	Name	Age	D-NO
1	A	20	11
2	B	30	24
3	C	30	18
4	D	25	13

→ PK (Table 1)      → Foreign Key

(not allowed as D-NO 18 is not defined as F.K of table 1 and table 2.)

Keep your face to the sunshine and you cannot see a shadow. - Helen Keller defines.)

(Table 2)

P.K	D - NO.	D - Location
11	Delhi	
24	uttarakhand	
13	Mumbai	

(→ Table 1 and Table 2 have some relationship which is shown by primary key and a foreign key.)

#### ④ Key constraints:

Keys are the entity set that is used to identify an entity within its entity set uniquely.

17 SUNDAY An entity set can have multiple keys, but out of which one key will be primary key.

A primary key can contain a unique value in the relational table.

eg:- → P.K

October '21							NOTES
Su	Mo	Tu	We	Th	Fr	Sa	
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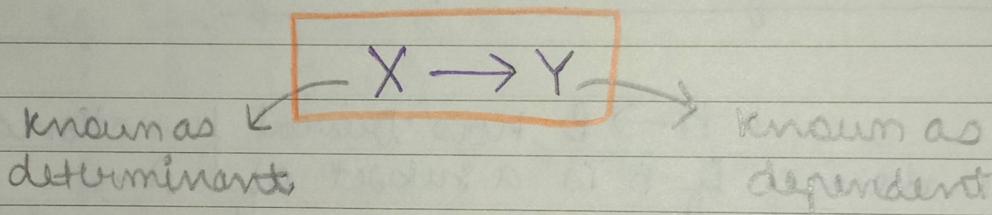
ID	Name	SEM	Age
101	Kamal	1 <sup>st</sup>	17
102	Karan	2 <sup>nd</sup>	24
103	Ravi	2 <sup>nd</sup>	21
102	Aman	1 <sup>st</sup>	22

Awareness functions almost like magic. - Osho  
 not allowed because all values of P.K must be unique.

9. • Functional dependencies :-

10. • The functional dependency is a relationship that exists between two attributes.

11. • It typically exists between the primary key and non-primary key attributes within a table.



3. for eg →

4. assume we have an employee table  
5. with attributes: Emp-ID, Emp-Name,  
6. Emp-Address.

7. Here, Emp-ID attribute can uniquely identify the Emp-Name attribute of employee table because if we know the Emp-ID, we can tell that employee name associated with it.

Functional dependency can be defined / written  
NOTES as :-

Emp-ID → Emp-Name

We can say Emp-Name is functionally dependent on Emp-ID.

If you are positive, you'll see opportunities instead of obstacles - Widad Akrawi

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## Types of functional dependency

**Trivial functional dependency**

**non-trivial functional dependency**

### ① Trivial functional dependency :-

- $A \rightarrow B$  has trivial functional dependency if  $B$  is a subset of  $A$ .
- The following dependencies are also trivial like  $A \rightarrow A$ ,  $B \rightarrow B$

$$\text{eg: } A = \{P, Q, R, S\}$$

$$B = \{P, Q\}$$

$\Rightarrow A \rightarrow B$  (it is trivial functional dependency).

eg → consider a table with two columns employee-id and employee-Name.

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$\{ \text{employee\_id}, \text{employee\_Name} \} \rightarrow \text{employee\_id}$  is a trivial functional dependency

as employee-Id is a subset of {employee-id, employee-Name}.

The flower doesn't dream of the bee. It blossoms and the bee comes. - Mark Nepo

## ② Non-Trivial functional dependency :-

•  $A \rightarrow B$  has a non-trivial functional dependency if  $B$  is not a subset of  $A$ .

• when  $A \cap B$  is NULL, then  $A \rightarrow B$  is called as complete non-trivial.

eg :  $A = \{P, Q, R\}$   
 $B = \{S, T\}$

$A \rightarrow B$   
is non trivial  
functional dependency

$$A \cap B = \{\text{NULL}\}$$

eg → consider a table with three columns emp-Id, emp-Name and emp-age.

$\text{emp-Id} \rightarrow \text{emp-Name}$  is a Non-trivial functional dependency because emp-Name is not a subset of emp-Id.

NOTES

- Closure of set of Functional dependencies
- The closure set of functional dependency is also known as Confluence rule.

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21

THURSDAY

October  
Week-43 (294-071)October  
Week-43 (295-071)

- The inference rule is a type of assertion. It can apply a set of FDL functional dependency to derive other functional dependency.

- it contains different rules:-

① reflexive rule →

(IR<sub>1</sub>)

if  $Y \subseteq X$  then  $X \rightarrow Y$   
 (Y is subset of X)      (X determines Y)

② Augmentation rule →

(IR<sub>2</sub>)

if  $X \rightarrow Y$  then  $XZ \rightarrow YZ$

③ Transitive rule →

(IR<sub>3</sub>)

if  $X \rightarrow Y$  and  $Y \rightarrow Z$

then  $X \rightarrow Z$

④ Union rule →

(IR<sub>4</sub>)

if  $X \rightarrow Y$  and  $X \rightarrow Z$  then

$X \rightarrow YZ$

⑤ Decomposition rule

(IR<sub>5</sub>)

if  $X \rightarrow YZ$  then  $X \rightarrow Y$   
 &  $X \rightarrow Z$

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NOTES

⑥ Pseudo transitive rule →

(IR<sub>6</sub>)

if  $X \rightarrow Y$  &  $YZ \rightarrow W$

then

$\xrightarrow{\text{by}} \text{replace } Y \text{ by } X!$

$XZ \rightarrow W.$

• Normalisation :-

• Normalisation is the process of organising the data in the database.

• It is used to minimize the redundancy from a relation or set of relations.

• It is used to eliminate undesirable characteristics like insertion, update and deletion.

• It divides the larger table into smaller and links them using relationships.

• The normal form is used to reduce redundancy from the database table.

→ When we normalize the database, we have

NOTES 4 goals:-

① arranging data into logical grouping such that each group describes a small part of the whole.

November '21						
Su	Mo	Tu	We	Th	Fr	Sa
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SATURDAY

October  
Week-43 (296-08)

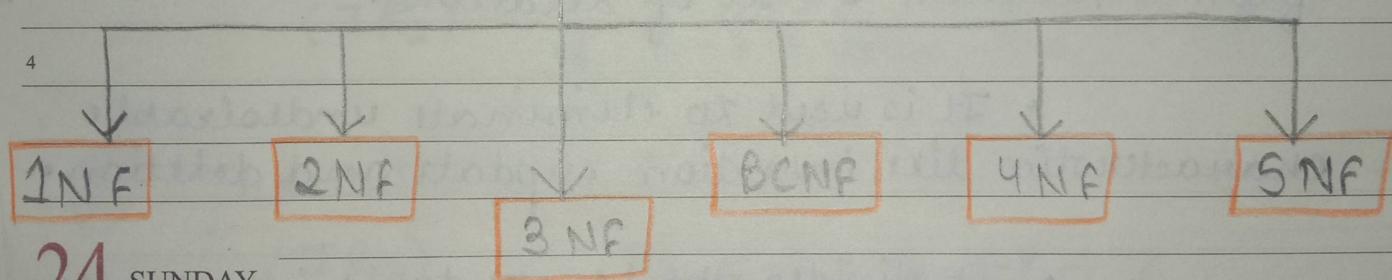
October  
Week-43

② minimizing the amount of duplicate data, called redundancy, stored in a database.

③ organising the data such that when you modify it, you make the changes only in one place.

④ Building a database in which you can access and manipulate the data quickly and efficiently without compromising the integrity of the data in storage.

### Types of Normal forms



24 SUNDAY



October '21						
Su	Mo	Tu	We	Th	Fr	Sa
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NOTES

True Patriotism is better than the wrong kind of piety. - Abraham Lincoln

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25

MONDAY

→ cannot hold multi-valued.

October '21

Week-44 (298-067)

• INF (First Normal Form) :-

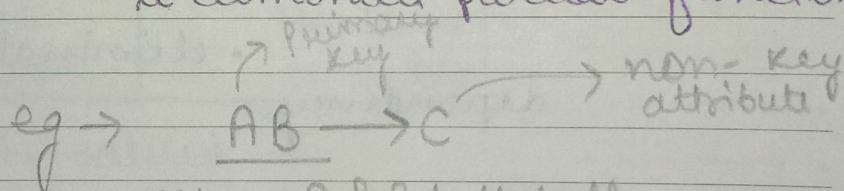
if it contains atomic values. (means single value)

- it eliminates repeating groups.

• 2NF (Second Normal Form) :-

in 2NF if it is in 1NF and all non-key attributes are fully functional dependent on the primary key.

- it eliminates partial functional dependency.



means A & B both fully  
should be dependent on C.  
whereas  $A \rightarrow C$  or  $B \rightarrow C$  are  
not allowed.

• 3NF (Third Normal Form) :-

3NF if it is in 2NF and no transitive dependency exists.

NOTES

- it eliminates transitive dependency.

eg →  $A \rightarrow B, B \rightarrow C \}$  should not be there  
then  $A \rightarrow C$

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No individual can win a game by himself. - Pele

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26

TUESDAY

October

Week-44 (299-066)

October '21  
Week 44 (300-066)

- BCNF (Boyce Codd's Normal form) :-

- A stronger definition of 3NF is known as Boyce Codd's Normal form.

- It is also called as 3.5NF.

- 4NF (Fourth Normal Form) :-

- A relation will be in 4NF if it is in Boyce Codd's Normal form and no multi-valued dependency.

- eliminate multi-values dependency,

- 5NF (Fifth Normal Form) :-

- A relation is in 5NF if it is in 4NF and does not contain any join dependency, joining should be lossless.

- eliminate Join dependency.

↓ for eg :-

October '21

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October '21  
ek-44 (300-065)

WEDNESDAY

27

\* 1NF

Sample.

Name	Roll No.	Address
Aman	01	Delhi, Mumbai
Karan	02	Pune, Haridwar
Ankit	03	Dehradun

(this table is not in 1NF)

Convert into 1NF.

Name	Roll NO.	Address
Aman	01	Delhi
Aman	01	Mumbai
Karan	02	Pune
Karan	02	Haridwar
Ankit	03	Dehradun

(it remove multi-valued attributes).

\* 2NF

Book order table such as :-

order No.	Title	qty	unit Price
1	CN	1	250
1	Java	1	275
1	DBMS	2	295
2	MMT	1	300
2	DS	1	190
3	DBMS	1	295
3	MANT	2	300
3	CN	5	250

To avoid pain, they avoid pleasure. To avoid death, they avoid life. - osho

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2023.05.22 13:37

28

THURSDAY

October '21  
Week-44 (301-0)October '21  
Week-44 (302-063)

(it is not a 2NF because it hold Partial Functional dependency and fully functional dependency).

title → unit price. ] P.F.D

and

order no, Title → qty ] F.F.D

Now we'll convert given table in 2NF to decompose the given table into two sub table such as :-

order master table:-

order NO.	Title	qty
1	CN	1
1	Java	1
1	DBMS	2
2	MMT	1
2	DS	1
3	MMT	2
3	CN	5

book master table:-

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SU	Mo	Tu	We	Th	Fr	Sa
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Title	unit Price
CN	250
Java	275
DBMS	295
MMT	300

The speed of the boss is the speed of the team. - Léo cocca

NOTES

## \* 3NF

used to reduce data duplication and  
used to achieve the data integrity.

$A \rightarrow B \rightarrow C$  (this cond<sup>n</sup> should not hold otherwise it'll be transitive)

here X should be superkey,

Y is a prime attribute such as each element  
of Y is part of some candidate key.

eg  $\rightarrow$  emp - Dep - Location table

emp-NO	E-Name	Sal	Dep-Name	Dep-Location
1001	Amit	7500	Accounts	102
1002	Karan	5000	sales	104
1003	Anuj	10000	Accounts	102

not a 3NF because it holds transitive dependency

NOTES  $\left\{ \begin{array}{l} \text{emp-NO} \rightarrow \text{Dep-Name} \rightarrow \text{Dep-Location} \\ \text{emp-NO} \rightarrow \text{Dep-Location} \end{array} \right\}$

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✓	7	8	9	10	11	12
✓	14	15	16	17	18	19
✓	21	22	23	24	25	26

to make it 3NF we decompose and remove  
the transitive dependency.

When you need to innovate, you need collaboration. - Marissa Mayer

30

SATURDAY

October

Week-44 (303-06)

So, we convert the given table in 3NF decompose two sub-table such as :-

Table 1 : emp - department

	emp-no	eName	Sal	Dep-name
1	1001	Amit	7500	Accounts
1	1002	Karan	5000	Salary
2	1003	Anuj	10000	Accounts

P.K

Table  
converted  
in 3NF.

Table 2 : Dep - Location

Dep-name	Dep-location
Accounts	102
sales	104

31 SUNDAY

### \* 4NF

- no multi valued dependency occurs when two or more independent multi-valued facts about the same attribute occurs within the same relation.

October '21

Su	Mo	Tu	We	Th	Fr	Sa
31			1	2		
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8	9	10	11	12	13	14
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29	30					

- MVD is denoted by  $X \rightarrow \rightarrow Y$

If "Y" be readers" then is M.V.D of "Y" "or" "X" is multi-determined?

NOTES

To learn to succeed, you must first learn to fail. - Micheal Jordan

08

FRIDAY

October '21  
Week-41 (281-084)

for eg → Faculty!

Faculty	Subject	Committee
A	DBMS	Placement
A	Java	Placement
A	C	Placement
A	DBMS	Scholarship
A	Java	Scholarship
A	C	Scholarship

→ In given faculty table is in 3NF, but the subject and committee are two independent entity. Hence, there is no relationship b/w subject and committee.

In the faculty relation, a faculty with faculty name ~~Kishore~~ A contains 3 subjects DBMS, Java and C, and 2 committee placement & scholarship.

So, there is a multi-valued dependency on faculty-name, which leads to unnecessary repetition of data.

$A \rightarrow \rightarrow \text{Placement}$

$A \rightarrow \rightarrow \text{Scholarship}$

NOTES



So to make above table 4NF, we can decompose it into 2 tables:-

It makes a big difference in your life when you stay positive. - Ellen DeGeneres

november '21

Su	Mo	Tu	We	Th	Fr	Sa
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09

SATURDAY

October

Week-41 (282-083)

September  
Week-40 (273-083)Table 1 :-

Faculty - course

Faculty	subject
A	DBMS
A	JAVA
A	C

Table 2 :-

Faculty - committee

Faculty	Committee
A	Placement
A	Scholarship

10

SUNDAY

• BCNF (Boyce-Codd Normal Form) :-

- BCNF is the advanced version of 3NF.  
It is stricter than 3NF.

October '21

Su	Mo	Tu	We	Th	Fr	Sa
31				1	2	
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

• A table is in BCNF if every functional dependency  $X \rightarrow Y$ ,   
 $X$  is super key of the table.

There are countless versions of yourself living in other people's mind. - Amadeus Wolfe

September '21

Week-40 (273-092)

THURSDAY

30

- 9 · for BCNF, the table should be in 3NF,  
 10 and for every functional dependency,  
 (X) LHS is superkey).

for example →

11 let us assume, there is a company  
 12 where employees work in more than one  
 1 department.

## 2 employee table

3 emp-Id	emp - Country	emp - Dept	Dept-type	Dept-no
4. 264	India	Designing	D394	283
264	India	Testing	D394	300
5. 364	UK	Stores	D283	232
364	UK	Developing	D283	549

6 in above table, F.D are as follows:-

7 emp-Id → emp - Country

emp-Dept → { Dept-type, Dept-no }.

### NOTES

candidate key: { emp-id, Emp-dept }

\* the table is not in BCNF bcz neither emp-id nor emp-dept alone are keys.

We all go through sad time, but I was brought up to be positive. - Jess Glynne

To convert into BCNF, we decompose it into 3 tables:-

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3	4	5	6	7	8	9
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24	25	26	27	28	29	30

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FRIDAY

October  
Week-40 (274-08)

## ① emp-country table :-

emp-id	emp-country
264	India
364	UK

## ② emp-Dept table :-

emp-Dept	Dept-type	Dept-No.
Designing	D 394	283
Testing	D 394	300
Stores	D 283	232
Developing	D 283	549

## ③ emp-Dept mapping table :-

emp-id	emp-Dept
D 394	283
D 394	300
D 283	232
D 283	549

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F o D :-

empid → emp-country  
 emp-dept → { dep-type,  
 emp-dept NO. }

Vision looks outward and becomes aspiration. - Stephen Samuel Wise

NOTES

September '21

Week-40 (271-094)

28

TUESDAY

Candidate Keys:

{ means  $X \rightarrow Y$   
( $X$  determines  $Y$ )  
then  $X$  must be a  
super key),  
then it'll be BCNF!

for 1st table  $\rightarrow$  emp-id

2nd table  $\rightarrow$  emp-dept

3rd table  $\rightarrow$  { emp-id, emp-dept }

Now, this is in BCNF because left side part  
of both the F.O is a key.

— X — X —

NOTES

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