Unit – 1 Introduction to Database Management System

TAPI DIPLOMA ENGINEERING COLLEGE, SURAT

Topics to be covered

- 1.1 Concepts and Definitions:
- Database and database systems and database environment
- 1.2 Data, Information, Data Item or Fields, Records, Files, Metadata, Data dictionary and it's components,
- 1.3 Schemas, Sub-schemas, and Instances
- 1.4 Data types
- 1.5 Database Language commands: Data Definition Language (DDL): CREATE, ALTER, TRUNCATE, DROP
- 1.6 Database Language: Data Manipulation Language (DML): INSERT, SELECT, UPDATE, DELETE
- 1.7 Transactional Control: Commit, Save point, Rollback
- 1.8 DCL Commands: Grant and Revoke

Definitions & Concepts of DB

1. **Data**
   - Data means known facts that can be stored.
   - For example age, salary, result etc…

2. **Database**
   - It is a collection of inter-related data
   - For example student information database, book bank database, college database etc…

Definitions & Concepts of DB

3. Management

- Manipulation, searching and security of data
- For example searching of product in amazon, viewing result in GTU website etc…

4. System

- Programs or tools used to manage database
- For example SQL Server Studio, Oracle 11g

5. DBMS (Database Management System)

- DBMS = Database + a set of programs (that manipulate the data)
- Data manipulation involves various operations like store data, modify data, remove data and retrieve data.

Definitions & Concepts of DB (Con..)

6. Metadata

- It is data about data.
- Data such as table name, column name, data type, authorized user for any table is called metadata for that table.

Faculty

Fac_ID	Name	From	Initial	Mobile
101	Nitin Rola	Rajkot	NJR	123456
102	Chintan Kanani	Rajkot	CNK	456789
103	Akash Siddhpura	Jamnagar	ANS	456123
104	Umesh Thoriya	Morbi	UHT	123789

Table Name – Faculty
Column Name – Fac_ID, Name, From, Initial, Mobile
Data Type – Varchar,Number
Authorized User – Retrieve and Update authentication given

Definitions & Concepts of DB (Con..)

7. Data dictionary

- It is an information repository which contains metadata.
- This can involves information such as table name, owners, column names, data types, size and constraints.

Faculty

Fac_ID	Name	From	Initial	Mobile
101	Nitin Rola	Rajkot	NJR	123456
102	Chintan Kanani	Rajkot	CNK	456789
103	Akash Siddhpura	Jamnagar	ANS	456123

Table Name – Faculty
Owner – Database User (Admin, Faculty, Student etc…)
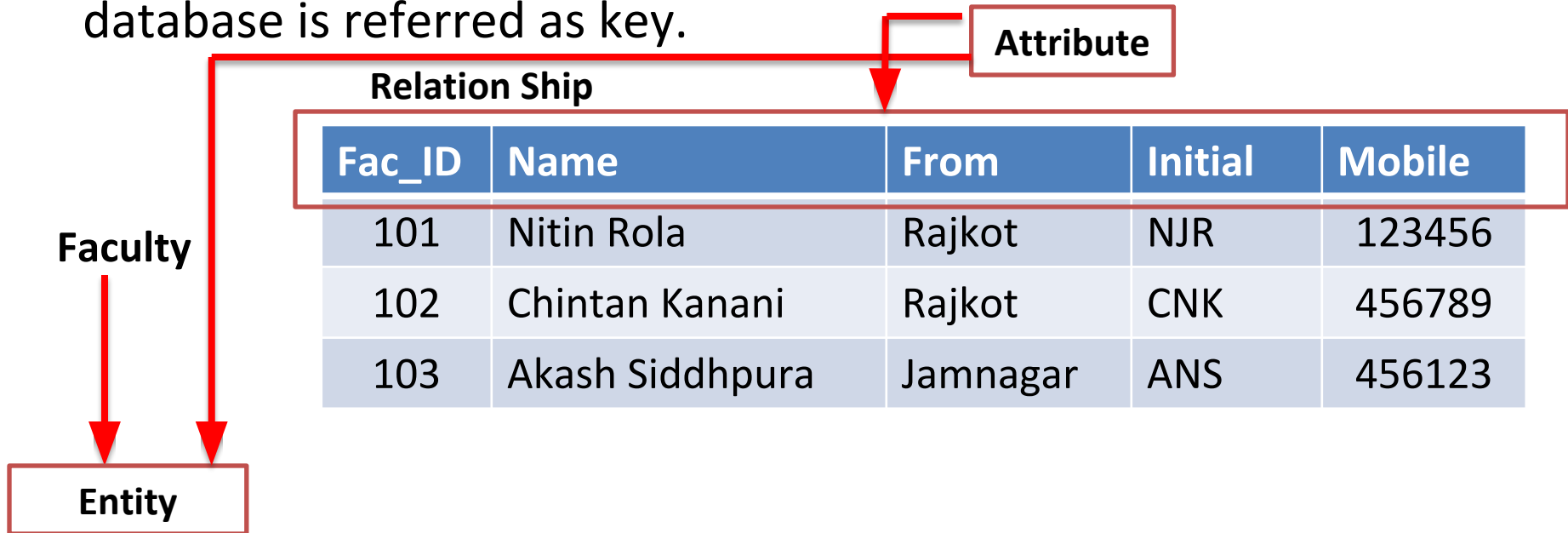Column Name – Fac_ID, Name, From, Initial, Mobile
Data Type – Varchar,Number
Size – 20, 10
Constraints – Not Null, Primary Key, Unique Key etc…

Definitions & Concepts of DB (Con..)

- Entities – A thing or object or person in the real world, that is different from all other object.

- Attribute – Property or characteristics of an entity.

- Relation Ship – It is an association between several entities.

- Key – A data item or a field which is used to identify a record in a database is referred as key.

Attribute

Relation Ship

Fac_ID	Name	From	Initial	Mobile
101	Nitin Rola	Rajkot	NJR	123456
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Faculty

Entity

Definitions & Concepts of DB (Con..)

8.   Data warehouse

- It is an information repository which stored data.
- It is design to facilitate reporting and analysis.

What is the difference between Data warehouse and Data dictionary ?

What is requirement to store Data warehouse and Data dictionary on different places ?

Definitions & Concepts of DB (Con..)

9. Data Items (Field)

- It is a character or group of characters (alphabetic or numeric) that have specific meaning.
- It is represented in the database by a value

10. Record

- It is a collection of logically related fields.
- Here each field in a record contains fix size and fixed data type.

Field

Record

Fac_ID	Name	From	Initial	Mobile
101	Nitin Rola	Rajkot	NJR	123456
102	Chintan Kanani	Rajkot	CNK	456789
103	Akash Siddhpura	Jamnagar	ANS	456123

Definitions & Concepts of DB (Con..)

11. Files

- It is collection of related records.
- These records are generally arranged in a specific sequence.

Data and Information

1. **Data**
   - Data Means knows facts, that can be stored
   - For Example, marks of 3 subject are given below, that is known as Data

   DBMS = 25, DS = 23, C++ = 24 → **Data**

2. **Information**
   - Information means processed or organized data
   - For Example, if we count the average of 3 subjects then it known as Information

   $(25+23+24)/3 = 24$ → **Information**

Differentiate Data and Information

Data	Information
Data Means knows facts, that can be recorded and have implicit meaning	Information means processed or organized data
Examples: • Student No: 12 • Student Name: ABC • City name : Rajkot • Account No: 123456789 • Balance : 10000	Examples: • Percentage : 81.31% (Derived from the marks of all subjects) • Run rate in cricket match : 5.3 run/over (Derived from total runs and overs)
Row materials used to derive information	Product derived from Data
Less useful	More useful

Schemas, Sub-schemas, and Instances

Schema : Schema is the overall description of the database. The basic structure of how the data will be stored in the database is called schema. Schema is of three types: Logical Schema, Physical Schema and view Schema.

Logical Schema – It describes the database designed at logical level.

Physical Schema – It describes the database designed at physical level.

View Schema – It defines the design of the database at the view level.

Instances : Instances are the collection of information stored at a particular moment. The instances can be changed by certain CRUD operations as like addition, deletion of data. It may be noted that any search query will not make any kind of changes in the instances.

Difference between Schema and Instance :

Schema	Instance
It is the overall description of the database.	It is the collection of information stored in a database at a particular moment.
Schema is same for whole database.	Data in instances can be changed using addition, deletion, updation.
Does not change Frequently.	Changes Frequently.
Defines the basic structure of the database i.e how the data will be stored in the database.	It is the set of Information stored at a particular time.

Describe different data types in SQL.

There are four basic data type available in SQL

Numerical

Character /string

Date and time

Binary

Numerical Data Types:

Used to store zero, negative and positive numerical values. These values can be fixed-point (whole numbers) or floating-point (real numbers).

No	Data Type	Represent
1	NUMBER(P,S)	Floating-point number. P: precision, i.e. maximum number of digits in a number. Precision can be up to 38 digits. S: scale, i.e. number of digits to the right of the decimal point. Ex: number(6,2) = 1234.79
2	NUMBER(P)	Fixed-lenght number. Ex: number(6) = 123456
3	NUMBER	Floating-point number with a precision of 38 digits.

Character/String data types

No.	Data Type	Description
1	CHAR(size)	Stores character string of fixed length. Size represents the number of characters to be stored Default size is 1. ✓ Maximum length is 255 characters.
2	VARCHAR(size)/ VARCHAR2(size)	✓ Stores character string of variable length. ✓ More flexible than CHAR. ✓ No default size will be considered. So, size must be specified explicitly. ✓ Maximum length is 2000 characters.
3	LONG	✓ Stores large amount of character strings of variable length. ✓ Maximum length is up to 2 GB. Only one column per table can be defined as LONG.

Binary Data Types:

Examples of data which comes under binary type are images, audio, and video files.

No.	Data Type	Description
1	RAW	Stores binary type data. Maximum length is up to 255 bytes.
2	LONG RAW	Stores large amount of binary type data. Often referred as binary large object. Maximum length is up to 2 GB.

Data Definition Language (DDL)

DDL changes the structure of the table like creating a table, deleting a table, altering a table, etc.
CREATE ,ALTER ,DROP ,TRUNCATE.

CREATE It is used to create a new table in the database.
SYNTAX:
CREATE TABLE TABLE_NAME (COLUMN_NAME DATATYPES[,....]);

EXAMPLE:
CREATE TABLE EMPLOYEE(Name VARCHAR2(20), Email VARCHAR2(100), DOB DATE);

DROP It is used to delete both the structure and record stored in the table.
Syntax : DROP TABLE table_name;
Example: DROP TABLE EMPLOYEE;

ALTER: It is used to alter the structure of the database. This change could be either to modify the characteristics of an existing attribute or probably to add a new attribute.

To add a new column in the table
 SYNTAX:
ALTER TABLE table_name ADD column_name COLUMN-definition;
 EXAMPLE
:ALTER TABLE STU_DETAILS ADD(ADDRESS VARCHAR2(20));

To modify existing column in the table:

SYNTAX:

ALTER TABLE table_name MODIFY(column_definitions....);

EXAMPLE :

ALTER TABLE STU_DETAILS MODIFY (NAME VARCHAR2(20));

Data Manipulation Language

DML commands are used to modify the database. It is responsible for all form of changes in the database.

INSERT,UPDATE,DELETE

INSERT: The INSERT statement is a SQL query. It is used to insert data into the row of a table.

Syntax:

INSERT INTO TABLE_NAME (col1, col2, col3,.... col N)

VALUES (value1, value2, value3, ... valueN);

INSERT INTO BOOK (Author, Subject) VALUES ("Sonoo", "DBMS ");

UPDATE This command is used to update or modify the value of a column in the table.

SYNTAX:UPDATE table_name SET [column_name1= value1,... column_nameN = valueN] [WHERE CONDITION] ;

EXAMPLE:UPDATE students   SET User_Name = 'Sonoo'   WHERE Student_Id = '3' ;

DELETE It is used to remove one or more row from a table.

SYNTAX: DELETE FROM table_name [WHERE condition];

EXAMPLE:
DELETE FROM javatpoint WHERE Author="Sonoo";

TRANSACTION CONTROL LANGUAGE (TCL)

- "Transaction is a set of database operation that performs a particular task"

- for example ,fund transfer from one account to another account . updating requires in source and destination accounts , so two database operations : one to debit an amount in source account and to create that amount in destination account.

- a transaction must execution as a whole or as none to maintain database consistency.

- Two commands are used for TCL:

    1. COMMIT

    2. ROLLBACK

    3. SAVEPOINT

COMMIT

- Using COMMIT command a transaction can be commited permanently.

- A transaction can be committed either-
  - Explicitly, or
  - Implicitly

Explicit commit: to explicit a transaction explicitly, user needs to request COMMIT command explicitly.

- A commit command terminates the current transaction and make all changes permanents made during the transaction.

  Syntax: COMMIT;

  Output: COMMIT complete.

COMMIT

- **Implicit commit**: there are some operation which forces a COMMIT to occur automatically, even user don't specify the COMMIT command.
- These operation involve execution of –

1) **QUIT Command:**

   -To end SQL*PLUS session disconnecting from the oracle.

2) **EXIT Command:**

    -To end SQL*PLUS session disconnecting from the oracle.

3) **Data Definition Language(DDL) Command**

   -Like CREATEALTER , And DROP COMMAND

ROLLBACK

- ROLLBACK means Canceling a transaction completely

- A ROLLBACK command terminates the current transaction, and undoes any changes made during transaction.

- oracle also performs auto rollback. In situation like,computer failure,oracle automatically rollback any uncommitted work

- **Syntax: ROLLBACK;**
- **Output: ROLLBACK complete.**

SAVEPOINT

- Saves the particular transaction at that point where it is used. it is use to partially save the transaction.

- A savepoint can be created using command SAVEPOINT as given below.

- **Syntax: SAVEPOINT savepoint_name;**
  Syntax: ROLLBACK TO SAVEPOINT

savepoint_name;

- **Output: ROLLBACK Complete.**

DATA CONTROL LANGUAGE (DCL)

- Security of information stored in database is one of the prime concern for any DBMS . an unauthorized access to a database must be prevented.

- User requiring an access to database must have valid user id an password to get login in the system. Also he/she must have privileges to access contents of the database. the rights that allow the user to use database contents are called privileges.

- Two commands are used in DCL:
    1) **GRANT-granting privileges**
    2) **REVOKE-revoking privileges**

GRANT

- This command is use to give permission to other user to use our table's data either for modification ,deletion , selection or insertion or it can be all
these four operation.

- Grant a privilege on table-name to user-name.

- Grant privilege on table-name to user-name with grant option;

- Can grant privilege only if you have been granted privilege (or if you are the administrator)

Syntax : GRANT object privilege

                     ON object name(table name)

                     TO user name

                     [with GRANT OPTION];

GRANT

Example : GRANT SELECT,INSERT

      ON customer TO

     user1

      WITH GRANT OPTION;

Output : GRANT succeeded.

REVOKE

- This command is use to take our permission away from user to table.

- Revoking privilege means to deny permissionto user given previously.

- Revokes a privilege on table-name from user-name.

- can revoke privilege only if you have been granted that privilege (or if you are the administrator)

Syntax : REVOKE Object privilege

ON object name(table name)

FROM user name;

REVOKE

Example : REVOKE SELECT,INSERT
ON customer FROM
user2;

Output : REVOKE succeeded.