Chapter 14:

MySQL Revision Tour

Informatics Practices

Class XII

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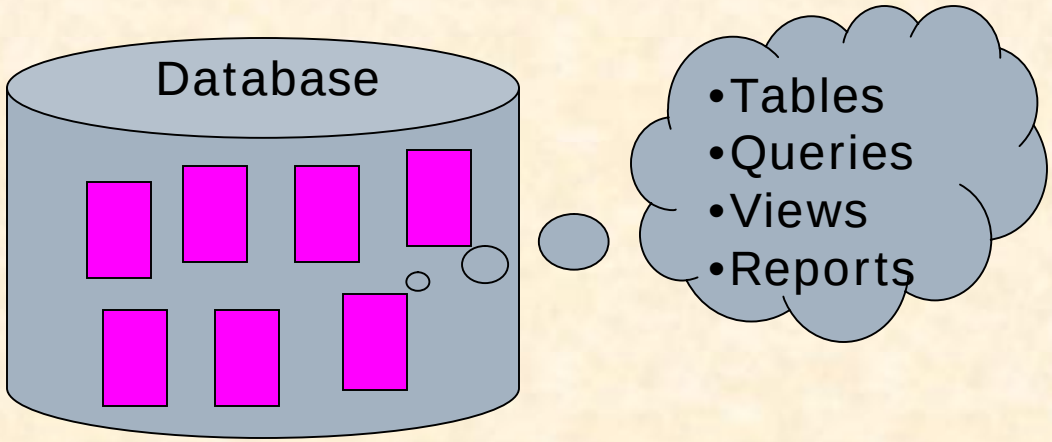
What is the Database?

- A database is a collection of interrelated data stored together to serve multiple application.
- It work like a container which contains the various object like Tables, Queries, Reports, Procedures in organized way.



What is the Database Management System (DBMS)?

- A DBMS refers to a software that is responsible for storing, maintaining and utilizing database in an efficient way.
- A Database along with DBMS software is called Database System.
- Example of DBMS software are Oracle, MS SQL Server, MS Access, Paradox, DB2 and MySQL etc.
- MySQL is open source free ware DBMS.

Why Database System is used? (Advantages)

- Databases reduces **Redundancy**

  It removes duplication of data because data are kept at one place and all the application refers to the centrally maintained database.

- Database controls **Inconsistency**

  When two copies of the same data do not agree to each other, then it is called Inconsistency. By controlling redundancy, the inconsistency is also controlled.

- Database facilitate **Sharing of Data**

  Data stored in the database can be shared among several users.

- Database ensures **Security**

  Data are protected against accidental or intentional disclosure to unauthorized person or unauthorized modification.

- Database maintains **Integrity**

  It enforces certain integrity rules to insure the validity or correctness of data. For ex. A date cant be like 25/25/2000.

- Database enforces **Standard**

  Database is maintained in a standard format which help to data interchange or migration of data between two systems.

Data Abstraction & Data Independence

View 1

View 2

View 3

Logical data Independence

Conceptual (Logical) Level

How & what data are stored?

Physical data Independence

Physical (Internal) Level

Database

What is Data Model?

At External Level or Conceptual level, various data model are used to shows 'How data is organized or stored' in the database. These Data Presentations are known as Data Model. It may be-

- **Relational Data Model**

  In this model data is organized into **Relations** or **Tables** (i.e. Rows and Columns). A row in a table represents a relationship of data to each other and also called a **Tuple** or **Record**. A column is called **Attribute** or **Field.**

- **Network Data Model**

  In this model, data is represented by collection of records and relationship among data is shown by **Links**.

- **Hierarchical Data Model**

  In this model, Records are organized as **Trees**. Records at top level is called Root record and this may contains multiple directly linked children records.

- **Object Oriented Data Model**

  In this model, records are represented as a objects. The collection of similar types of object is called class.

Data Models

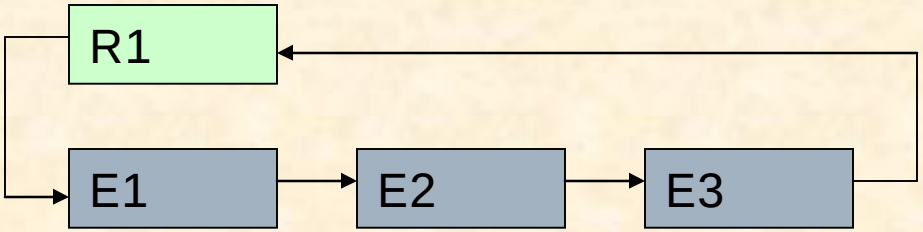
Attribute (Field)

Table (Relation)

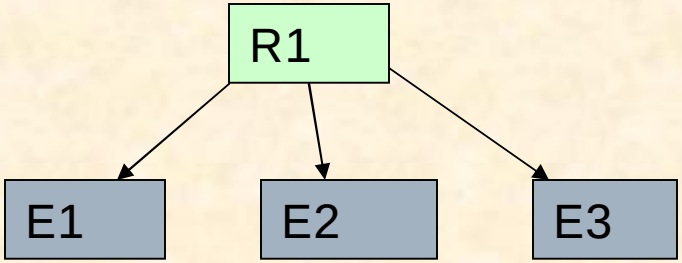
Entity (Record)

Name	Address	DOB	City	Phone
Amar	2/3 Chowk	01.04.1990	Kanpur	12345
Kailash	22 Katra	23.10.1992	Lucknow	67890

Relational Model



Network Model



Hierarchical Model

Representation of Records and Relationship in various Data Model

Relational Model Terminology

Relational Model was developed by E.F.Codd of the IBM and used widely in the most of the DBMS.

- **Relation (Table)**

  A Relation or Table is Matrix like structure arranged in Rows or Columns. It has the following properties-

  - All items in a column are homogeneous i.e. same data type.
  - Each column assigned a unique name and must have atomic (indivisible) value.
  - All rows of a relation are distinct i.e. no two identical rows (records) are present in the Relation.
  - Ordering or Rows (Records) or Columns (fields) are immaterial.

- **Domain**

  It is collection of values from which the value is derived for a column.

- **Tuple / Entity / Record**

  Rows of a table is called Tuple or Record.

- **Attribute/ Field**

  Column of a table is called Attribute or Field.

- **Degree**

  Number of columns (attributes) in a table.

- **Cardinality**

  Number of Records in a table.

Concept of Keys

As discussed earlier, In a Relation each record must be unique i.e. no two identical records are allowed in the Database. A key attribute identifies the record and must have unique value.

- **Primary Key**

  A set of one or more attribute that can identify a record uniquely in the relation is called Primary Key.

- **Candidate Key**

  All attribute combinations that can serve as primary key are called Candidate keys as they are candidate to become as primary key.

- **Alternate Key**

  A Candidate Key that is not a Primary key is called Alternate key.

- **Foreign Key**

  A non-key attribute whose values are derived from the primary key of some other table is called Foreign key.

  Foreign Key is used to implement **Referential Integrity** in the Database.

Introduction to MySQL

- MySQL is an open source, free and powerful Relational Database Management System (DBMS) that uses SQL.
- It was developed by Michael Widenius and AKA Monty. It was named after Monty's daughter *My*. The logo of MySQL – the dolphin, is named as *Sakila*.
- It is a fast, reliable, scalable alternative to many of the commercial RDBMS.
- MySQL is created and distributed by MySQL AB, a company based in Sweden, now part of the Sun Microsystems.
- It can be freely downloaded from www.mysql.org

Key features of MySQL

- **Speed**
  It if faster than most of the commercial RDBMSs like Oracle, MS SQL Server.
- **Free of Cost**
- It is available free of cost as Open Source database. It is part of LAMP (Linux, Apache, MySQL, PHP/ Perl/ Python)
- **Portability**
- It can be installed and run on different types of Hardware and Operating System platform.
- **Security**
- It offers privilege and password system for authorization.
- **Connectivity**
- It may connect various types of client using different protocols and Programming Languages.
- **Query Language**
- It uses SQL (Structured Query Language) as query language, which is standardized by ANSI.

Types of SQL Commands

The commands of SQL can be categorized in the followings-

- **Data Definition Language (DDL)**

  These SQL commands are used to create, alter and delete database objects like table, views, index etc.

  Ex. CREATE TABLE, CREATE VIEW, CREATE INDEX,

  ALTER TABLE, DROP TABLE, DRP INDEX etc.

- **Data Manipulation Language (DML)**

  These commands are used to insert, delete, update and retrieve the stored records from the table.

  Ex. SELECT...., INSERT..., DELETE..., UPDATE.... etc.

- **Transaction Control Language (TCL)**

  These commands are used to control the transaction.

  Ex. COMMIT, ROLLBACK, SAVEPOINT etc.

- **Data Control Language (DCL)**

  These commands are used to manipulate permissions or access rights to the tables etc. Ex. GRANT.. , REVOKE...

MySQL Elements

- **Literals:**
  - Literals refers to the fixed data value. It may be Numeric or Character. Numeric literals may be integer or real numbers and Character literals must be closed in single quotes like ‘Hello’.
- **Null values:**
  - If a column in a row has no value then it is said to NULL. The Null should not be used as a Zero value.
- **Comment:**
  - /*…. */ (Multi line comment)
  - -- … (single line comment)
  - # … (single line comment from the appearance)
- **Data types:**
  - Numeric type
  - Date & Time type
  - String or Text type

Data Types in MySQL

- **Numeric Data Types:**
  - **INTEGER or INT** – up to 11 digit number without decimal.
  - **SMALLINT** – up to 5 digit number without decimal.
  - **FLOAT (M,D)** – Real numbers up to M digit with D decimal places e.g. Float (10,2)
  - **DECIMAL(M,D) or NUMERIC(M,D)**
    – Unpacked floating point up to M length and D decimal places.
- **Date & Time Data Types:**
  - **DATE** - A date in YYYY-MM-DD format.
  - **DATETIME** – A date and time format like YYYY-MM-DD HH:MM:SS
  - **TIME** - Stores time in HH:MM:SS format.
- **String or Text Data Type:**
  - **CHAR(M)** - A fixed length string up to 255 characters. (default is 1)
  - **VARCHAR(M)** – A variable length string up to 255 characters.
  - **BLOB** – Used to store image data or characters up to 65535.
  - **TEXT** – Same as BLOB but offers case insensitive search.

Some Data Management commands in MySQL

- **Creating a Database.**

  The following command will create School database in MySQL.

  Ex. mysql> **CREATE DATABASE *School*;**

- **Opening a database**

  To open an existing database you can use the following command.

  Ex. mysql> **USE *school* ;**

- **Creating a table in the database**

  To create a table we can use Create Table…. command. The following command will create Student table with *Stname* and *Stcity* columns.

  Ex. mysql> **CREATE TABLE student**
  (Stname char(30),
  Stcity char(20),
  age Integer);

- **Inserting a Record in a table**

  mysql> **INSERT INTO Student VALUES ('Amit', ' Suratgarh', 16);**

- **Getting listings of database and tables**

  mysql> **SHOW DATABASES;**

  mysql> **SHOW TABLES;**

- **Deleting a Table and database**

  mysql> **DROP TABLE Student ;**

  mysql> **DROP DATABASE School ;**

- **Viewing Table Structure**

  mysql> **DESCRIBE Student ;**

Making Simple Queries

The SELECT command of SQL, empower you to make a request (queries) to retrieve records from the database.

The syntax of SQL is given below-

SELECT < [Distinct | ALL] *| column name(s)>
FROM <table(s)>
WHERE <condition>
ORDER BY <column name> [ASC | DESC] ;

Consider the table ***Student*** as –

StID	Name	Fname	DOB	City	Class
S1	Amitabh	Harivansh Rai	1948-11-10	Allahabad	12
S2	Sharukh	Firoz	1970-05-10	Delhi	11
S3	Irphan	Akbar	1970-10-05	Jaipur	11
S4	Salman	Salim Javed	1972-04-10	Mumbai	10
S5	Abhishek	Amitabh	1975-03-12	Mumbai	10

Making Simple Queries – Cont..

Selecting all columns

If you want to view all columns of the student table, then you should give the following command-

mysql> **SELECT * FROM Student ;**

MySQL will display the all records with all columns in the Student table.

* Is used to represent all columns.

StID	Name	Fname	DOB	City	Class
S1	Amitabh	Harivansh Rai	1948-11-10	Allahabad	12
S2	Sharukh	Firoz	1970-05-10	Delhi	11
S3	Irphan	Akbar	1970-10-05	Jaipur	11
S4	Salman	Salim Javed	1972-04-10	Mumbai	10
S5	Abhishek	Amitabh	1975-03-12	Mumbai	10

Making Simple Queries – Cont..

☐ Selecting columns

If you want to view only **Name** and **City** columns of the student table

mysql> **SELECT Name, City FROM Student ;**

Name	City
Amitabh	Allahabad
Sharukh	Delhi
Irphan	Jaipur
Salman	Mumbai
Abhishek	Mumbai

mysql> **SELECT City, Name FROM Student ;**

City	Name
Allahabad	Amitabh
Delhi	Sharukh
Jaipur	Irphan
Mumbai	Salman
Mumbai	Abhishek

Making Simple Queries – Cont..

- **Eliminating Duplicate values in a column - DISTINCT**

mysql> **SELECT City FROM Student ;**

City
Allahabad
Delhi
Jaipur
Mumbai
Mumbai

Mumbai is repeated

mysql> **SELECT DISTINCT City FROM Student ;**

City
Allahabad
Delhi
Jaipur
Mumbai

Only Unique Cities are displayed

Making Simple Queries – Cont..

☐ Doing simple calculations

We can also perform simple calculations with SQL Select command. SQL provide a dummy table named DUAL, which can be used for this purpose.

mysql> **SELECT 4*3 FROM DUAL ;**

We can also extend this idea with a columns of the existing table.

mysql> **SELECT Name, Sal *12 FROM EMP ;**

☐ Using Column Aliases

We can give a different name to a column or expression (Alias) in the output of a query.

Alias for Sal*12

mysql> **SELECT Name, Sal*12 AS 'Annual Salary' FROM EMP;**

mysql> **SELECT Name, DOB AS 'Date of Birth' FROM Student;**

mysql> **SELECT 22/7 AS PI FROM Dual;**

- ✓ When Alias name is a single word then ' ' is not rquired.
- ✓ In MySQL FROM DUAL is optional i.e *Select 4*3 ;* is valid

Making Simple Queries – Cont..

☐ Displaying Text in the Query output

We can also display any text in the query out put.

mysql> **SELECT 'Mr.' , Name, City FROM Student ;**

mysql**> SELECT Name, 'Rs', Sal from Emp;**

Mysql> SELECT Name, 'Rs', Sal*12 AS 'Annual Salary'
FROM Emp;

☐ Handling NULL Values

MySQL stores a special value called NULL for empty cells, which is displayed when data is not available or missing.

We can substitute this NULL by a text or message to get more readable out put. **IFNULL(<column name>, <text>)** can be used for this purpose.

mysql> **SELECT Name, IFNULL(DOB, 'Not Available') FROM Student;**

mysql> **SELECT Name, IFNULL(Class, 'Not allotted') FROM Student;**

Selecting Specific Rows – WHERE clause

- **WHERE <Condition>**

  We can select specific records by specifying condition with WHERE clause.

mysql> **SELECT * FROM Student WHERE City='Mumbai';**

StID	Name	Fname	DOB	City	Class
S4	Salman	Salim Javed	1972-04-10	Mumbai	10
S5	Abhishek	Amitabh	1975-03-12	Mumbai	10

mysql**> SELECT Name, Fname, City from Student**
WHERE Class >10;

Name	Fname	City	Class
Amitabh	Harivansh Rai	Allahabad	12
Sharukh	Firoz	Delhi	11
Irphan	Akbar	Jaipur	11

- We can operators to make a complex conditions

Selecting Specific Rows – WHERE clause

Relational Operators

We can use the following Relational operators in condition.

=, > , < , >=, <=, <>, IS , LIKE, IN, BETWEEN

Logical Operators

We can use the following Logical Operators to connect two conditions.

OR (||) , AND (&&) , NOT (!)

```
mysql> SELECT Name, City from Student
       WHERE City <> 'Mumbai' AND Class>10;

mysql> SELECT * FROM Emp
       WHERE Sal >10000 OR Job ='Manager';

mysql> SELECT * FROM Student
       WHERE NOT Grade='A';
```

Selecting Specific Rows – WHERE clause

☐ Specifying Range of Values – BETWEEN Operator

```
mysql> SELECT * FROM Emp
       WHERE Sal BETWEEN 5000 AND 10000 ;
```

The same query can also be written as -

```
mysql> SELECT * FROM Emp
       WHERE Sal >= 5000 AND Sal<=10000 ;
```

Other Logical operators also can be applied-

```
mysql> SELECT * FROM Emp
       WHERE  NOT Sal BETWEEN 5000 AND 10000 ;
```

☐ Specifying List – IN Operator

```
mysql> SELECT * FROM Emp
       WHERE Sal IN (5000, 10000) ;
```

The same query can also be written as -

```
mysql> SELECT * FROM Emp
       WHERE Sal = 5000 OR Sal =10000 ;
```

```
mysql> SELECT * FROM Student
       WHERE  City IN ('Mumbai', 'Delhi','Kanpur') ;
```

Selecting Specific Rows – WHERE clause

☐ Pattern Matching – LIKE Operator

A string pattern can be used in SQL using the following wild card

- **% - Represents any substring**
- **_ - Any Character**

Example.

'A%' – represents any string starting with 'A' character.
'_ _A' - represents any 3 character string ending with 'A'.
'_B%' - represents any string having second character 'B'
'_ _ _' – represents any 3 letter string.

A pattern is case sensitive and can be used with LIKE operator.

```
mysql> SELECT * FROM Student WHERE Name LIKE 'A%';
mysql> SELECT * FROM Student WHERE Name LIKE '%Singh%';
mysql> SELECT Name, City FROM Student
       WHERE Class>=9 AND Name LIKE '%Kumar%' ;
```

Selecting Specific Rows – WHERE clause

☐ Searching NULL Values – IS Operator

mysql**> SELECT * FROM Student WHERE City IS NULL ;**

The NOT Operator can also be applied -

mysql**> SELECT * FROM Student WHERE City IS NOT NULL;**

☐ Ordering Query Result – ORDER BY Clause

A query result can be orders in ascending (A-Z) or descending (Z-A) order as per any column. Default is Ascending

mysql**> SELECT * FROM Student ORDER BY City;**

To get descending order use DESC key word.

mysql**> SELECT * FROM Student ORDER BY City DESC;**

mysql**> SELECT Name, Fname, City FROM Student**
Where Name LIKE 'R%'
ORDER BY Class;

Working with Functions?

- **Definition:**

  A function is a special types of command that performs some operation and returns a single value as a result.

  It is similar to method or function in JAVA, which can be called by giving some argument.

- **Types of Functions:**
  - Numeric Functions
  - String Functions
  - Date & Time Function
  - Aggregate Functions

Numeric Functions

- **These functions may accept some numeric values and performing required operation, returns numeric values as result.**

Name	Purpose	Example
MOD (M, N)	Returns remainder of M divide by N	Select MOD(11,4) ; ➔ **3**
POWER (M, N) POW (M, N)	Returns M^N	Select POWER(3,2); ➔ **9**
ROUND (N [,M])	Returns a number rounded off up to M place. If M is -1, it rounds nearest 10.	Select ROUND(15.193,1); ➔**15.2**
SIGN (N)	Returns sign of N. -1 if N<0, 1 if N>0 and 0 if N=0	Select SIGN(-15); ➔ **-1**
SQRT (N)	Returns square root of N	Select SQRT(25); ➔ **5**
TRUNCATE(N,M)	Returns number after truncating M decimal place.	Select TRUNCATE(15.79,1) ➔ **15.7**

String Functions

Name	Purpose	Example
CHAR()	Returns the character for given number (ASCII)	Select CHAR(65, 66.3); ➔ AB
CONCAT()	Returns concatenated string	Select CONCAT(Name, City) from Student;
LOWER()/ LCASE()	Returns the argument in lower case.	Select LOWER('ABC'); ➔ Abc
UPPER()/ UCASE()	Returns the argument in upper case.	Select UPPER('abc'); ➔ ABC
LTRIM()/ RTRIM()/ TRIM()	Removes Leading/Trailing/both spaces.	Select TRIM(' ABC '); ➔ 'ABC'
LEFT()/ RIGHT()/ MID()	Returns the given number of character from left/right / given mid position from the string.	Select MID('Computer',4,3); ➔ put
SUBSTR()	Returns the substring for given position and length.	Select SUBSTR('Computer',3,2); ➔ mp For backward Position use (-ve)
INSTR()	Returns the index of first occurrence of given text.	Select INSTR('Common', 'm'); ➔3
LENGTH()	Returns the length of given string	Select LENGTH('Common'); ➔6

Date & Time Functions

Name	Purpose	Example
CURDATE() | CURRENT_DATE()	Returns the current date	Select CURDATE(); ➔ 2010-10-02
SYSDATE()	Returns the current date & Time as YYYY-MM-DD HH:MM:SS	Select NOW(); ➔ 2010-10-02 11:30:02
SYSDATE()	Returns the current date & Time as YYYY-MM-DD HH:MM:SS	Select SYSDATE(); ➔ 2010-10-02 11:30:10
DATE()	Returns the date part of a date time expression.	Select DATE(SYSDATE()); ➔ 2010-10-02
MONTH() / YEAR()	Returns the Month/Year from given date argument.	Select MONTH(CURDATE()); ➔ 10
DAYNAME()	Returns the name of the weekday	Select DAYNAME(CURDATE()); ➔ SUNDAY
DAYOFMONTH()	Returns the day of month (1-31).	Select DAYOFMONTH(CURDATE());
DAYOFWEEK()	Returns the day of week (1-7).	Select DAYOFWEEK(CURDATE());
DAYOFYEAR()	Returns the day of year(1-366).	Select DAYOFYEAR(CURDATE());

Aggregate Functions

Name	Purpose	Example
SUM()	Returns the sum of given column.	Select SUM(Pay) from Emp; Select Sum(Pay), Sum(Net) from Emp;
MIN()	Returns the minimum value in the given column.	Select MIN(Pay) from Emp;
MAX()	Returns the maximum value in the given column.	Select MAX(Pay) from Emp;
AVG()	Returns the Average value of the given column.	Select AVG(Pay) from Emp;
COUNT()	Returns the total number of values/ records as per given column.	Select COUNT(Name) from Emp; Select COUNT(*) from Emp;

Handling Database

- **Creating Database:**

  You can create a database in MySQL by using the following DDL command.

  CREATE DATABASE [IF NOT EXIST] <Database name>

  mysql> CREATE DATABASE School;

  mysql> CREATE DATABASE IF NOT EXIST School;

- **Opening Database:**

  USE <database name>

  mysql>USE School;

- **Removing Database:**

  DROP <database name>

  mysql>DROP School;

Handling Tables

Creating Tables:

CREATE TABLE < Table Name>

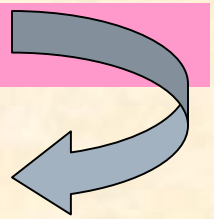
(<Col name><data type>[(size)][Constraints], ...)

- **Data types**

  Commonly used data types are-

  INTEGER,DECIMAL(P,D), NUMERIC(P,D), CHAR(n), VARCHAR(n), DATE etc.

Emp (empID, ename, sex, grade, gross)



```
mysql> CREATE TABLE Emp
       ( empID integer,
         ename char(20),
         sex  char(1),
         grade char(2),
         gross decimal  );
```

Handling Tables Cont...

- **Viewing Table Structure:**

  You can view structure of any table after using database as-

  DESC[RIBE] <table name>

  mysql> DESC Student;

- **Deleting Table:**

  You can delete an existing table as-

  DROP TABLE [IF EXIST] <table name>

  mysql> DROP TABLE Student;

- **Creating Table from Existing Table:**

  CREATE TABLE <Table name>
  AS (<Select Query>);

```
mysql> CREATE TABLE Staff
        ( Select empID, ename, sex  From Emp);
```

```
mysql> CREATE TABLE Staff
        ( Select * From Emp);
```

It will create identical table as Emp

Constraints in the Table

A Constraint is a condition or check applicable to a column or table which ensures the integrity or validity of data.

Constraints are also called Integrity constraints. The following constraints are commonly used in MySQL.

S.N	Constraints	Description
1	**NOT NULL**	Ensures that a column cannot have NULL value.
2	**DEFAULT**	Provides a default value for a column, when nothing is given.
3	**UNIQUE**	Ensures that all values in a column are different.
4	**CHECK**	Ensures that all values in a column satisfy certain condition.
5	**PRIMARY KEY**	Used to identify a row uniquely.
6	**FOREIGN KEY**	Used to ensure Referential Integrity of the data.

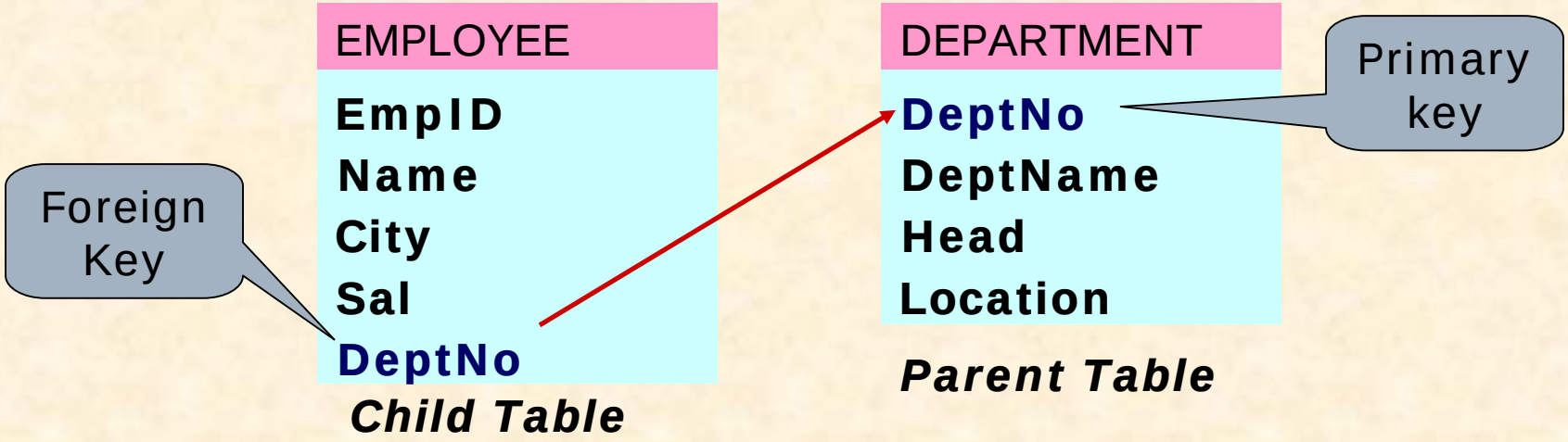
Implement Constraints in the Table

Generally constraints are applied at the time of creating table.

```
mysql> CREATE TABLE Student
       ( StCode   char(3)    NOT NULL PRIMARY KEY,
         Stname   char(20)   NOT NULL,
         StAdd    varchar(40),
         AdmNo    char(5)    UNIQUE,
         StSex    char(1)    DEFAULT = 'M',
         StAge    integer    CHECK (StAge>=10),
         Stream   char(1)    CHECK Stream IN ('S', 'C', 'A')
       );
```

Implementing Foreign Key Constraints

- A Foreign key is non-key column in a table whose value is derived from Primary key of some other table.
- Each time when record is inserted/updated the other table is referenced. This constraints is also called Referential Integrity Constraints.
- This constraints requires two tables in which Reference table (having Primary key) called Parent table and table having Foreign key is called Child table.



Implementing Foreign Key Cont..

```
CREATE TABLE Department
( DeptNo     char(2)   NOT NULL PRIMARY KEY,
  DeptName   char(10)  NOT NULL,
  Head       char(30) );
```

Parent table should be created first.

```
CREATE TABLE Employee
( EmpNo  char(3) NOT NULL PRIMARY KEY,
  Name   char(30)  NOT NULL,
  City   char(20),
  Sal    decimal(8,2),
  DeptNo char(2),
  FOREGIN KEY (DeptNo) REFERENCES Departmet (DeptNo));
```

Foreign key as table level constraints... written after all columns.

Alternatively, it can applied in front of column itself... without using *Foreign Key* keyword.

```
DeptNo char(2) REFERENCES Departmet (DeptNo),
```

Implementing Foreign Key Cont..

- **Other options with FOREIGN KEY**

  What will happen, when a primary key value is deleted or updated in parent table, which is being referred in child table?

We can set the following options with FOREIGN KEY.

ON DELETE CASCADE / RESTRICT/ SET NULL/ NO ACTION

ON UPDATE CASCADE / RESTRICT/ SET NULL/ NO ACTION

CASCADE:

The values of Foreign key in child table, will be updated or referenced record will be deleted automatically.

RESTRICT:

This option will reject any Delete or Update operation on Primary key of Parent table.

SET NULL:

This option will set NULL value in referenced records of Foreign key in child table.

NO ACTION:

No any action will be taken when any Delete/Update operation is carried in Primary key of Parent table.

```
CREATE TABLE Employee
( ……..
  FOREIGN KEY DeptNo REFERENCE Department (DeptNo)
  ON DELETE CASCADE ON UPDATE CASCADE );
```

Modifying Table Structure

You can alter (modify) the structure of existing table by the using ALTER TABLE…. Command of MySQL.

You can do the following with the help of ALTER TABLE.. Command.

- **Add a new Column & Constraints**
- **Modifying existing column (name, data type, size etc.)**
- **Delete an existing column & Constraints**
- **Changing Column Name**

ALTER TABLE <Table Name>

ADD|MODIFY|DROP|CHANGE <Options>

Modifying Table Structure cont..

- **Adding new column**

  ALTER TABLE <Table Name>
  ADD <Column><data type> <size>[<Constraints>]

```
mysql> ALTER TABLE Student ADD (TelNo Integer);
mysql> ALTER TABLE Student
       ADD (Age Integer CHECK (Age>=5) );
mysql> ALTER TABLE Emp
       ADD (Sal Number(8,2) DEFAULT 5000 );
```

- **Modifying Existing Column**

  ALTER TABLE <Table Name>
  MODIFY <Column><data type> <size> [<Constraints>]

```
mysql> ALTER TABLE Student
       MODIFY (Name VARCHAR(40));
mysql> ALTER TABLE Emp MODIFY (Sal DEFAULT 4000 );
```

Modifying Table Structure cont..

- **Removing Column & Constraints**

  ALTER TABLE <Table Name>
  DROP COLUMN <Column name> <Constraints>

```
mysql> ALTER TABLE Student
       DROP COLUMN TelNo;
mysql> ALTER TABLE Student
       DROP PRIMARY KEY;
mysql> ALTER TABLE Emp
       DROP COLUMN JOB, DROP FOREIGN KEY ;
```

- **Changing Column Name of Existing Column**

  ALTER TABLE <Table Name>
  CHANGE [COLUMN] <Old name><New Name>

```
mysql> ALTER TABLE Student
       CHANGE COLUMN Name Stname;
```

Using DML Commands

- **Inserting Record into table:**

  You can insert record in the table by using by using the following DML command.

  INSERT INTO <Table Name> [<Column list>]

  VALUES <list of values>

  Suppose a table named STUDENT has been created with the following structure.

StID	NAME	FNAME	DOB	CITY	CLASS

We can insert a record as follows-

```
mysql> INSERT INTO Student VALUES
      ('s1','Amitabh', 'Harivansh','1955-10-25', 'Mumbai', 12);
mysql> INSERT INTO Student VALUES
      ('s2','Sharukh Khan', NULL,'1972-5-25', 'Delhi', 10);
mysql> INSERT INTO Student (StID, FName, Name, Class)
        VALUES ('s3','Amitabh', 'Abhishek', 10);
```

Using DML Commands cont..

- **Inserting Record from Another table:**

  You can insert all or selected record(s) in the table from another table by using Select ... command in place of Values.

  Suppose a table named NEWSTUDENT has been created and records to be inserted from OLDSTUDENT table having the same structure of columns.

```
mysql> INSERT INTO Newstudent
       VALUES ( SELECET * FROM Oldstudent);
mysql> INSERT INTO Newstudent
       VALUES ( SELECT * FROM Oldstudent
                WHERE City='Mumbai');
mysql> INSERT INTO Newstudent (StID, FName, Name, Class)
       VALUES (Select StID,FName,Name,Class
               FROM Oldstudent  WHERE Class >=11);
```

Using DML Commands cont..

- **Deleting Record from the table:**

  You can delete all or selected record(s) from the table by using the following DDL command.

  DELETE FROM <Table Name> [WHERE <Condition>]

  mysql> DELETE FROM Student ;
  mysql> DELETE FROM Student WHERE City='Mumbai' ;
  mysql> DELETE FROM Student WHERE Class >=11 ;

  - **You can recall (Undelete) records by giving ROLLBACK command.**

    mysql> ROLLBACK ;
  - **You can issue COMMIT command to record the changes permanently.**

    mysql> COMMIT ;

Using DML Commands Cont...

- **Modifying Records in the table:**

  You can modify the values of columns of all or selected records in the table by using the following DDL command.

UPDATE <Table Name> SET <Column> = <Expression>
[WHERE <Condition>]

```
mysql> UPDATE Student SET Class =10 ;
mysql> UPDATE Student
       SET FName= CONACT('Mr.', FName') ;
mysql> UPDATE Emp SET Sal = Sal+(Sal*10/100);

mysql> UPDATE Emp SET Sal = Sal+(Sal*10/100)
       WHERE Sal <=10000;
mysql> UPDATE Emp SET City = 'Suratgarh'
       WHERE CITY IS NULL;
```