CLASS XI (SUBJECT -IP)
DATABASE MANAGEMENT SYSTEM

Data and Information

The raw facts constitutes **data**. The facts may be related to any person, place, activity or things. It may be stored in the form of text, graphics, audio or video.

Information is the processed or organized form of data. If data is not correct or accurate, the information obtained by processing such data may not be correct. For example, marks obtained by students and their roll numbers is the data, while the report card/sheet is the information.

A database is a collection of logically related data items stored in an organised manner. The information being stored in a database can be added, modified, deleted or displayed according to the requirements of the user.

DBMS The software that is used to create, update and retrieve data is known as database management system (DBMS). It facilitates planning and maintenance of the database for the user. Some of the common examples of DBMS are MS Access, Open Office or LibreOffice Base, Oracle, Ingress, MySQL.

What are the advantages of DBMS?

1. **Data Redundancy Control**: DBMS reduces data duplication by centralizing data, ensuring that each piece of data is stored only once.
2. **Data Integrity and Consistency**: Ensures data accuracy and consistency across the system, which improves reliability for users and applications.
3. **Data Security**: DBMS provides security features such as authentication and authorization, helping to protect data from unauthorized access.
4. **Efficient Data Access and Management**: Allows for quick data retrieval and manipulation through queries, making data management faster and more efficient.
5. **Concurrent Access and Multi-User Support**: Allows multiple users to access and modify data at the same time without conflicts, enhancing productivity.
6. **Data Backup and Recovery**: DBMS includes features for automatic data backup and recovery, which protects data in case of system failures.
7. **Improved Data Sharing**: DBMS enables easy data sharing among different users and departments in an organization.
8. **Enforces Standards**: Ensures that all data adheres to a consistent format and rules, which simplifies data maintenance and improves data quality

Organised Storage – The data in the database is stored in an organised manner, so that retrieval of the required data is fast and accurate.

Data Analysis – A database helps in analysis of data based on certain criteria. It is easy to find out maximum or minimum value, average or mean using a database.

Data Sharing – If the same data set is required for different applications then the database can be shared with other applications. Hence using a database means making once and using it repeatedly for multiple applications.

Minimal Data Redundancy – In the event of requiring the same data field in several tables the data field might get repeated in number of tables. This is called as data redundancy. This can be reduced by using DBMS tools.

Data Consistency – By minimising data redundancy, chances of inconsistent data being stored is reduced. For example, it should not happen that the name of the student is changed in one table and not in another. Such inconsistency is reduced by using a DBMS.

Increases Efficiency – Since database tables are properly organised, saving, reading and searching data can be carried out efficiently.

Increases Accuracy – Since data redundancy and inconsistency can be minimised in a database, the data is retrieved accurately from the database.

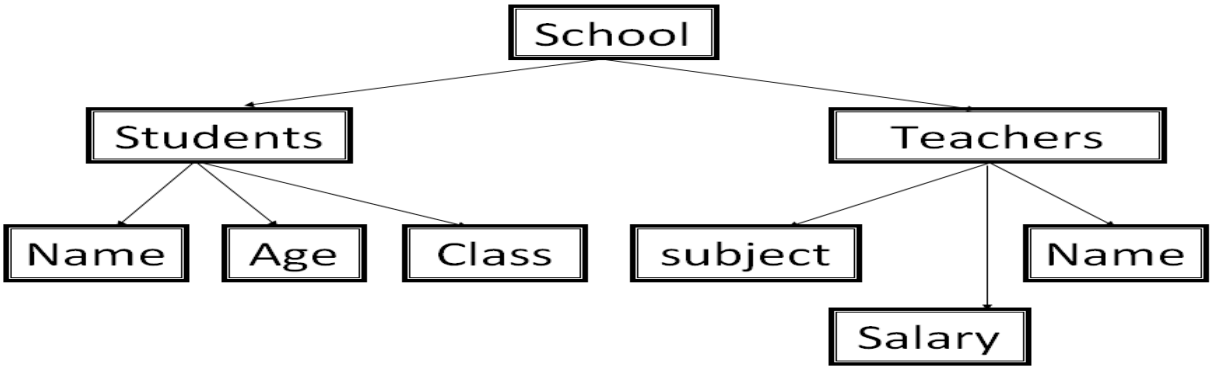
Increases Validity – Properties of different data fields can be assigned when a database is planned. So whether or not valid data is being entered can be checked at the data entry stage. This increases the validity of the database. For instance, we may set up a restriction while creating the table that the amount of fees being entered should be more than 1000.

Security – Unauthorised access can be controlled by assigning passwords to the users. The data might be translated in such a manner that unauthorised users are not able to read it. This is known as encryption. Both these measures increase the security of the database

What the Data Models (Just ADD Images)

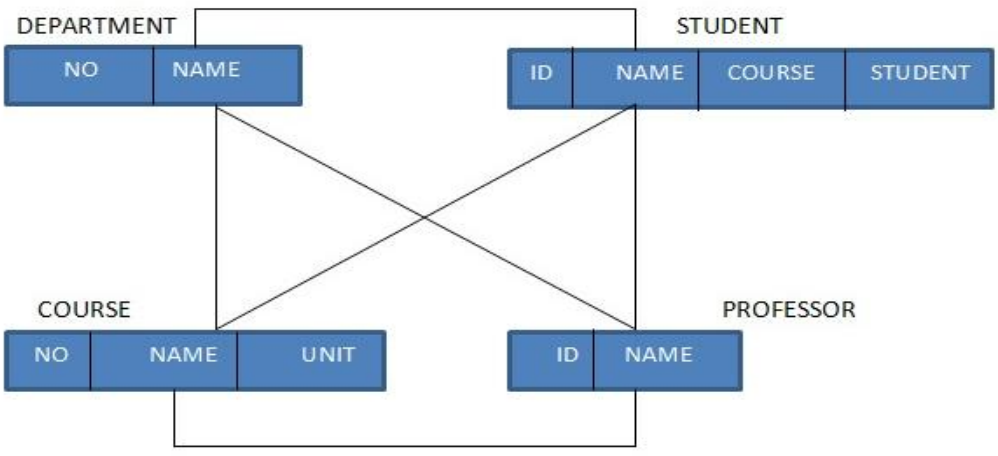
1. Hierarchical Data Model

- Organizes data in a tree-like structure.
- Data is represented as parent-child relationships (e.g., directories in a file system).
- Works well for applications with a clear hierarchy, such as organizational structures.
- Examples: XML, IBM Information Management System (IMS).



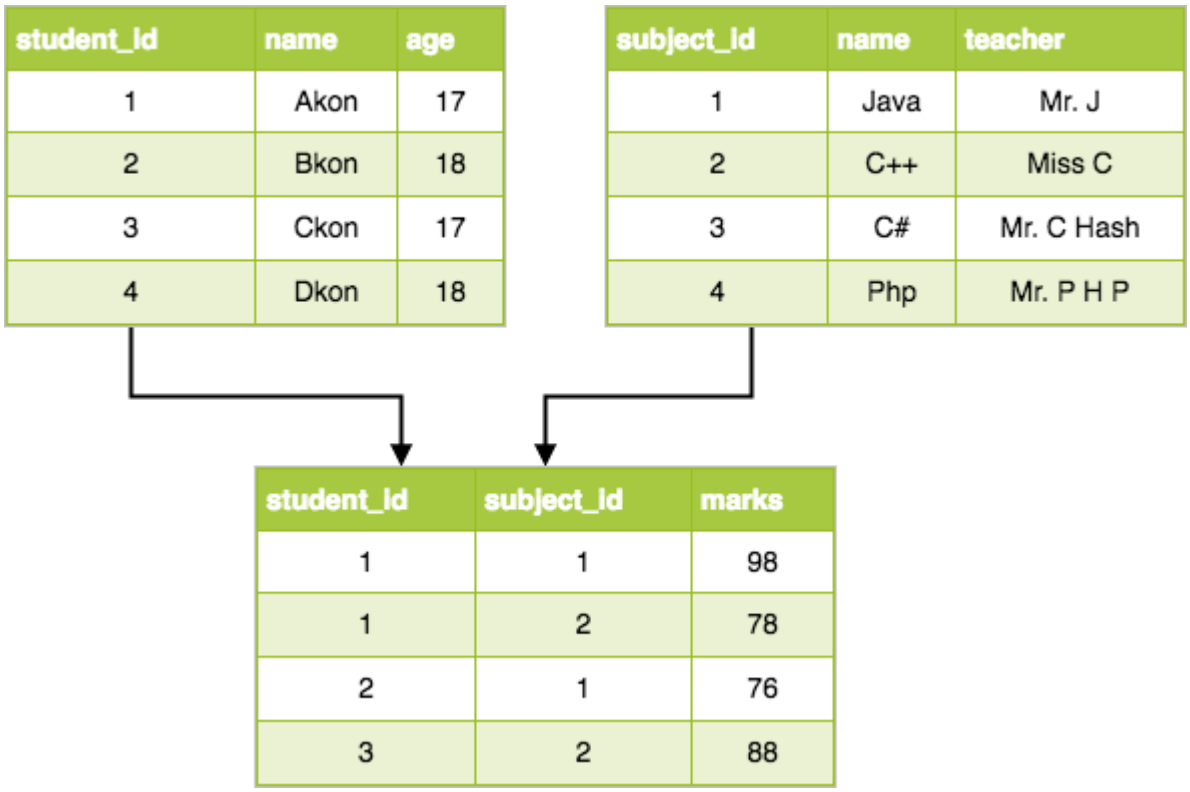
2. Network Data Model

- Represents data as a graph with multiple parent-child relationships, allowing many-to-many relationships.
- More flexible than hierarchical models, though complex to design and manage.
- Examples: CODASYL Database Model.



3. Relational Data Model

- Structures data as tables (or relations) with rows and columns, where each row represents a record and each column represents an attribute.
- Based on set theory and operations like selection, projection, and join.
- Most widely used for business applications and supports Structured Query Language (SQL).
- Examples: MySQL, PostgreSQL, Oracle.



student_id	name	age
1	Akon	17
2	Bkon	18
3	Ckon	17
4	Dkon	18

subject_id	name	teacher
1	Java	Mr. J
2	C++	Miss C
3	C#	Mr. C Hash
4	Php	Mr. P H P

student_id	subject_id	marks
1	1	98
1	2	78
2	1	76
3	2	88

Data can be organized into two types:-

Flat File: Data is stored in a single table. Usually suitable for less amount of data.

Relational: Data is stored in multiple tables and the tables are linked using a common field. It is suitable for medium to large amount of data.

Database Servers – Database servers are dedicated computers that hold the actualdatabases and run only the DBMS and related software.

RDBMS:- A relational database management system (RDBMS) is a database management system that is based on the relational model. In the relational model of a database, all data is represented in terms of tuples (rows), grouped into relations (tables). A database organized in terms the relational model is a relational database.

Database Concepts:- Database contains objects that are used for storingand managing Information.

What are the Relational Database Terminology?

Entity: An entity is a real-world thing which can be distinctly identified like a person, place or a concept. *Example:* Person, car, Bank Account, Student etc.

Example: *If we have a table of a Student (Roll_no, Student_name, Age, Mobile_no) then each student in that table is an entity and can be uniquely identified by their Roll Number i.e Roll_no.*

Student

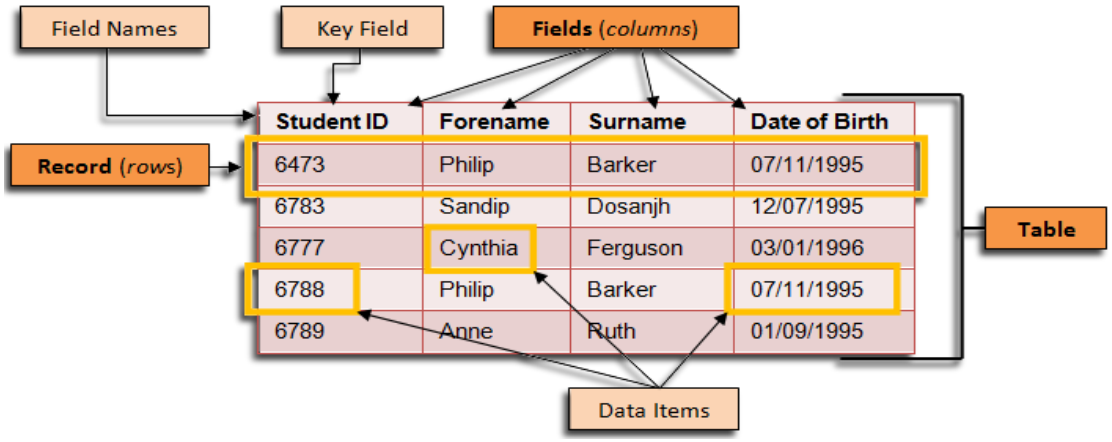
Roll_no	Student_name	Age	Mobile_no
1	Andrew	18	7089117222
2	Angel	19	8709054568
3	Priya	20	9864257315
4	Analisa	21	9847852156

Entity

What is a table?

A table is a collection of logically related records. It is organised as a set of columns, and can have any number of rows. The data in an RDBMS is stored in the form of **tables**. This table is basically a collection of related dataentries and it consists of columns and rows.

A table is the most common and simplest form of data storage in a relational database. The following program isan example of a CUSTOMERS table –



Student ID	Forename	Surname	Date of Birth
6473	Philip	Barker	07/11/1995
6783	Sandip	Dosanjh	12/07/1995
6777	Cynthia	Ferguson	03/01/1996
6788	Philip	Barker	07/11/1995
6789	Anne	Ruth	01/09/1995

What is Field or Columns or attributes ?

A field is the smallest entity in the database.

Fields are individual record characteristics and are presented as columns within a table.The fields in the STUDNT table consist of STUDENT ID, FORENAMENAME, SURNAME and DOB. A field is a column in a table that is designed to maintain specific information about every record in the table.

A collection of fields make a record,
A collection of records make a table and
A collection of tables make a database.

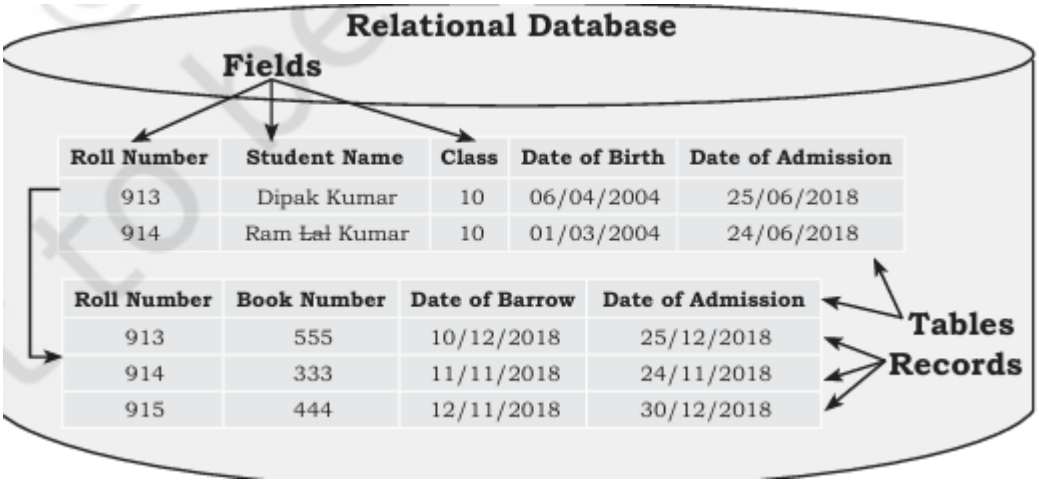
What is a Record or a Row?

A record is also called as a row of data is each entry that exists in a table. For example, there are 5 records in the above STUDENT table. A record is a horizontal entity in a table. Following is a single row of data or record in the STUDENT table –

6777	Cynthia	Ferguson	03/01/1996

Data Values – Data values are the raw data represented in numeric, character or alphanumeric form. Examples of data values are 'Abhinav Bindra', '26' 'shooting', "Chandigarh", "10-12-2018", etc.

Relational Database – A relational database is a collection of related tables.



1. **What is a Primary key in a table ?**

   A Primary key is a column in a table which consists of unique values i.e. it cannot have duplicate values or null values. (null – no value). For example in a table school admission number can be a primary key as it ismust and unique for all students.

2. **What is alternate key ?**

An alternate key is any candidate key that is not chosen as the primary key. These keys are also capable of uniquely identifying records in the table but are used as secondary options for the primary key

3. **What is candidate key?**

A candidate key is a column or a set of columns in a table that can uniquely identify each record in that table. Each table can have multiple candidate keys, but only one can be selected as the primary key. Candidate keys must have unique values and cannot contain null values.

4. **What is Foreign key in a database?**

   A **foreign key** is a **key** used to link two tables together. A **Foreign Key** is a column whose values are derived from the Primary **Key** of another table. This is sometimes also called as a referencing **key**.

Student Registration Table

Enrolment Number	Student Name	Class	Date of Birth	Date of Admission
XX1234567890	Dipak Kumar	10	06/04/2004	25/06/2018
XX1234567891	Ram Kumar	10	01/03/2004	24/06/2018

Primary key: Enrollment Number

Student Marks Table

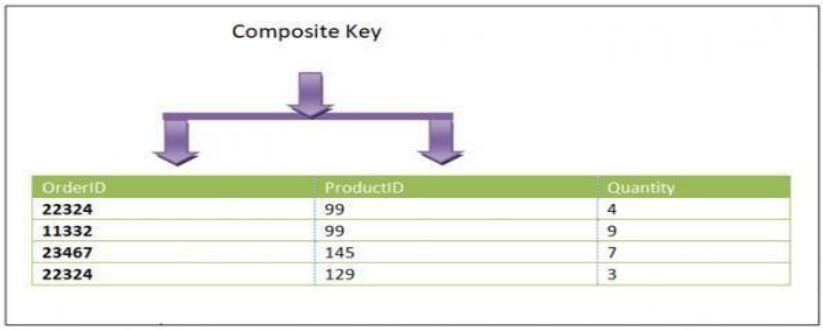
Roll Number	Maths	Science	Vocational	Enrolment Number
44983	87	75	80	XX1234567890
44990	74	45	75	XX1234567891

Primary key – Roll Number, **Foreign key –** Enrollment Number

5. **What is Composite key?**

A composite primary key is a primary key made up of two or more columns in a table, collectively unique, that

together can uniquely identify each record. It is used when a single column is not sufficient to ensure uniqueness across records.An **example** can be –



OrderID	ProductID	Quantity
22324	99	4
11332	99	9
23467	145	7
22324	129	3

Here our composite key is **OrderID** and **ProductID**

6. How is primary key different from foreign key? Explain with example.

ANS: The primary key is a key, which uniquely identifies the record in a table. While the foreign key is used to make the relationship between two tables. A foreign key is a non-key, whose value is derived from the primary key of the master table.

7. Give one point of difference between

(a) Data and Information,

(B) Network and hierarchical data model

Answer: (a) Data and Information:

(i) Data is an unprocessed data, while information is a processed data.

(ii) Data is the collection of raw facts, figures, and symbols, while information is the meaningful collection of data.

(II) Network and hierarchical data model

ANS: In the **Network model**, multiple records are linked to same master file. It is also considered as an inverted tree.

In the **Hierarchical model**, the data is organized into a tree like structure.

Q8. How can we define a primary key in a table?

Ans. A Primary key is a field which is unique for each and every record in a table. To make a particular field as the primary key, place the mouse pointer before the field name, and right click. A pop up menu appears and Select the Primary Key option. A key icon appears before the field name indicating that it is a primary key.

Important Question

Q . How data is organized in a RDBMS ?

Ans :- In RDBMS, data is organized in the form of inter linkedtables.

ROWS OR RECORDS OR TUPLES :- A row represents a single, data items in a table. Each row in a table represents a set of related data, andevery row in the table has the same structure.

Q . What are the different types of Data Types

DATA TYPES :- Datatypes are used to identify the type of data we aregoing to store in the database. A data type refers to the type of data that will be stored in that particular field. The memory size of a field varies according to its data type.

Q. Differentiate between:

(a) Memo and Varchar data type

Memo	Varchar
It is used to store long alphanumeric data. for example Summary of a book, review of a movie etc.	It is used to store small alphanumeric data. for example Name, Address etc.
It can store text data up to 64,000 characters.	It can store text data up to 255 characters.

(b) Number and Decimal data type

Ans.

Number	Decimal
It is used to store integers of any length.	It is used to store decimal values.
for example 457, 342	for example 23.56, 458.29

(c) Design View and Datasheet view of a table

Ans.

Design View	Datasheet View
This view is used to design the structure of the table.	This view is used to enter the values in the table.
In this view, we can add or delete the fields	In this view, we can add or delete the rows

Categories of data types:- Data types can be broadly classified into fivecategories:-

1. Numeric Types
2. Alphanumeric Types
3. Date Time
4. Other variable Type

1. NUMERIC TYPES:- They are used for describing numeric values likemobile number, age, etc.

The different types of numeric data types available are-

1. Boolean (Yes / No)
2. TinyInt (Tiny Integer)
3. SmallInt (Small Integer)
4. Integer
5. BigInt (Big Integer)
6. Numeric
7. Decimal
8. Real
9. Float
10. Double

2. ALPHANUMERIC TYPES:-

The list of different datatypes available in alphanumeric types are

1. LongVarChar (Memo) (Long Text)
2. Char (Text-fix) (Small Text)
3. VarChar(Text) (Text of specified Length)
4. VarChar_IgnoreCase(Text)

3. BINARY TYPES:- Binary types are used for storing data in binary formats. It can be used for storing photos,music files or (in general file of any format) etc.

The list of different datatypes available in Binary types are :-

1. LongVarBinary (Image)
2. Binary (Binary (fix))
3. VarBinary (Binary)

4. DATE TIME:- Date time data types are used for describing date and time values for the field used in the table of a database. It can be used for storing information such as date of birth, date of admission etc.

The list of different data types available in Date Time type are :-

1. Date (Stores month, day and year information)
2. Time (Store hour , minute and second information)
3. Timestamp (Stores date and time information)

Q Give names of any two RDBMS.

MYSQL, MS-ACCESS, Database(OPEN OFFICE – APACHE), LIBREOFFICE BASE, OPENOFFICE BASE

Q What is the difference between char and varchar datatype of SQL?

A CHAR field is a fixed length, and VARCHAR is a variable length field. This means thatthe storage requirements are different - a CHAR always takes the same amount of space regardless of what you store, whereas the storage requirements for a VARCHAR vary depending on the specific string stored.

Relationships between Tables

While working with multiple tables, you need to check the redundancy and inconsistency of data. The record for a particular entity should neither be repeated nor different data values should appear for a single entity in the database. This is done by setting relationship between the tables of a database. The most important prerequisite for setting a relationship is that there must be a common field(s) between the two tables to create a relationship.

Table 10.1: Student_Details

Admission No	Name	Father's Name	Class	DOB
1001	Mampi	D K Bose	10	12/3/2004
1005	Harnoor	Tej Singh	9	2/5/2005
1110	Sanjeeva	B Reddy	10	13/11/2004
1002	Neeru	Rajesh Jain	7	14/11/2006
1134	Urjit	Mahesh Patel	10	7/7/2003

Table 10.2: Student_Result

Roll No	Admission No	Class	Aggregate_Marks
1	1001	10	78
2	1110	10	93
3	1134	10	46

Types of Relationships

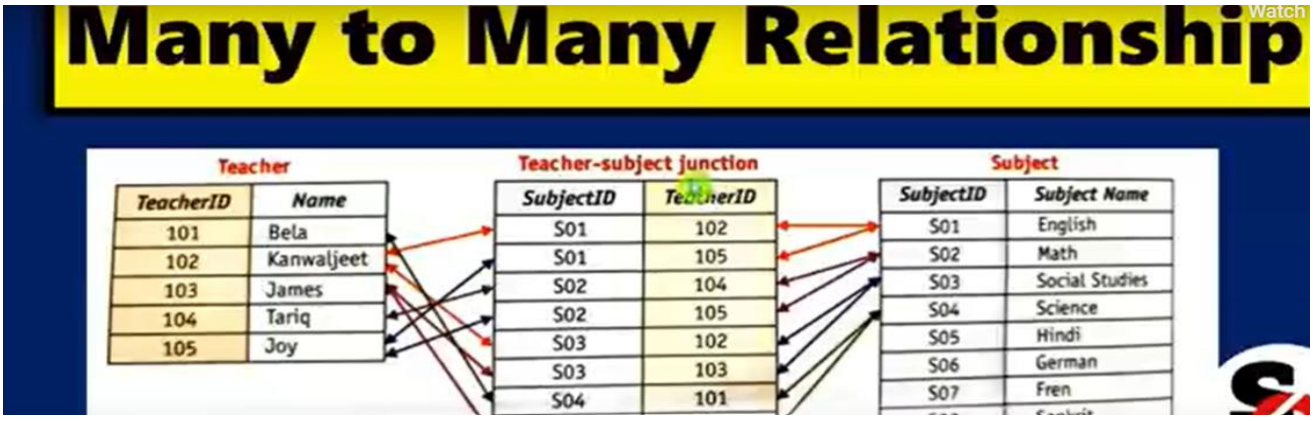
The type of relationship between any two tables in a database is based on the number of records that are present in the transaction table corresponding to the master table. These are:

(i) One-to-One (ii) One-to-many (iii) Many-to-Many

i. **One-to-One relationship**: In this type of relationship, one specific record of a master table has one and only one corresponding record in the transaction table.

ii. **One-to-Many relationship** : This is one of the most common types of relationship between the tables in a database. As the name says, in this type of relationship, one specific record of the master table has more than one corresponding records in the related transaction table.

iii. **Many-to-Many relationship** : In this type of relationship, there will be multiple records in the master table that correspond to multiple records in the transaction table as well. Generally this type of relationship is set when certain records have to be saved more than once in both the related tables.



Advantages of Relating Tables in a Database

1. A relationship can help prevent data redundancy.
2. It helps prevent missing data by keeping deleted data from getting out of synch.
3. Creating relationships between tables restricts the user from entering invalid data in the referenced fields.
4. Any updation in the master table is automatically reflected in the transaction tables.

Q. Define referential integrity. Who maintains referential integrity in a database?

Ans. Referential integrity refers to the relationship between tables. Referential integrity is used to maintain accuracy and consistency of data in a relationship. RDBMS will allow only that corresponding record to be entered in the transaction table which already exists in the master table.
DBMS maintains referential integrity in a database.
E.g. if a record, say Admission No as 1001 is not present or deleted in the master table of Student database, then there should be no record with Admission no as 1001 in the transaction table as well.

Q. How is redundancy or inconsistency controlled in a database? Explain with an example.

Ans. Redundancy or inconsistency is controlled in a database by setting the relationship between tables which help in checking that neither the records are duplicated nor there is variable data value for a particular field in two or more tables. After creating relationship between table, then adding or updating a record in one table reflect the changes in all the related tables.