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11. DATABASE CONCEPTS

Section – A

Choose the best answer **(1 Mark)**

1. What is the acronym of DBMS?
   a) DataBase Management Symbol b) Database Managing System
   c) DataBase Management System d) DataBasic Management System
2. A table is known as
   a) tuple b) attribute **c) relation** d)entity
3. Which database model represents parent-child relationship?
   a) Relational b) Network **c) Hierarchical** d) Object
4. Relational database model was first proposed by
   a) E F Codd b) E E Codd c) E F Cadd d) E F Codder
5. What type of relationship does hierarchical model represents?
   a) one-to-one **b) one-to-many** c) many-to-one d) many-to-many
6. Who is called Father of Relational Database from the following?
   a) Chris Date b)Hugh Darween **c) Edgar Frank Codd** d) Edgar Frank Cadd
7. Which of the following is an RDBMS?
   a) Dbase b) Foxpro c) Microsoft Access **d) SQLite**
8. What symbol is used for SELECT statement?
   a) σ b) Π c) X d) Ω
9. A tuple is also known as
   a) table **b) row** c) attribute d) field
10. Who developed ER model?
    a) Chen b) EF Codd c) Chend d) Chand

Section-B

Answer the following questions **(2 Marks)**

1. Mention few examples of a database.

- Foxpro
- dbase.
- IBM DB2.
- Microsoft Access.
- Microsoft Excel.
- MySQL.

2. List some examples of RDBMS.

- SQL Server
- Oracle
- MySQL
- MariaDB
- SQLite

3. What is data consistency?

- Data Consistency means that data values are the same at all instances of a database.
- On live data, it is being continuously updated and added, maintaining the consistency of data can become a challenge.
- But DBMS handles it by itself.

4. What is the difference between Hierarchical and Network data model?

Hierarchical data model	Network data model
• In hierarchical model, a child record has only one parent node	• In a Network model, a child may have many parent nodes.
• It represents one-to-one relationship called parent-child relationship in the form of tree structure.	• It represents the data in many-to-many relationships.

5. What is normalization?

- Normalization is an integral part of RDBMS in order to reduce data redundancy and improve data integrity.

Section-C

Answer the following questions **(3 Marks)**

1. What is the difference between Select and Project command?

Select Command	Project Command
• The SELECT operation is used for selecting a subset with tuples according to a given condition C.	• The projection method defines a relation that contains a vertical subset of Relation.
• Select filters out all tuples that do not satisfy C.	• The projection eliminates all attributes of the input relation but those mentioned in the projection list.
Symbol : σ	**Symbol :** Π
General Form: $\sigma_c(R)$ **Example:** $\sigma_{course = \text{“Big Data”}}(STUDENT)$	**Example:** $\Pi_{course}(STUDENT)$

2. What is the role of DBA?

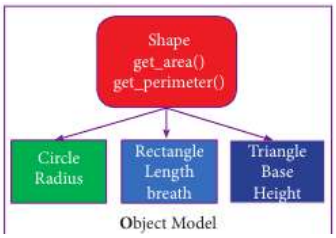
- Database Administrator or DBA is the one **who manages the complete database** management system.
- DBA takes care of the security of the DBMS, managing the license keys, managing user accounts and access etc.

3. Explain Cartesian Product with a suitable example.

- Cross product is a way of combining two relations.
- The resulting relation contains, both relations being combined.
- This type of operation is helpful to merge columns from two relations.
- **Example:** A x B means A times B, where the relation A and B have different attributes.

4. Explain Object Model with example.

- Object model stores the data in the form of objects, attributes and methods, classes and Inheritance.
- This model handles more complex applications, such as Geographic information System (GIS), scientific experiments, engineering design and manufacturing.
- It is used in file Management System.
- It represents real world objects, attributes and behaviors.



Object Model

5. Write a note on different types of DBMS users.

Database Administrators

- Database Administrator or DBA is the one who manages the complete database management system.

Application Programmers or Software Developers

- This user group is involved in developing and designing the parts of DBMS.

End User

- End users are the one who store, retrieve, update and delete data.

Database designers:

- They are responsible for identifying the data to be stored in the database for choosing appropriate structures to represent and store the data.

Section - D

Answer the following questions: **(5 Marks)**

1. Explain the different types of data model.

Data Model

A data model describes how the data can be represented and accessed from a software after complete implementation

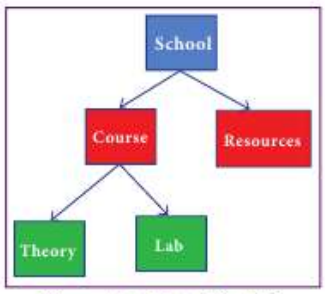
Types of Data Model

The different types of a Data Model are,

- Hierarchical Model
- Relational Model
- Network Database Model
- Entity Relationship Model
- Object Model

i). Hierarchical Model:

- In Hierarchical model, data is represented as a simple tree like structure form.
- This model represents a one-to-many relationship ie parent-child relationship.
- One child can have only one parent but one parent can have many children.
- This model is mainly used in IBM Main Frame computers.
- **Example:**



Hierarchical Model Fig. 11.3

ii). Relational Model

- The Relational Database model was first proposed by E.F. Codd in 1970 .
- The basic structure of data in relational model is tables (relations).
- All the information's related to a particular type is stored in rows of that table.
- Hence tables are also known as relations in a relational model.
- A relation key is an attribute which uniquely identifies a particular tuple (row in a relation (table)).

- **Example:**

Stu_id	Name	Age
1	Malar	17
2	Suncar	16
3	Velu	16

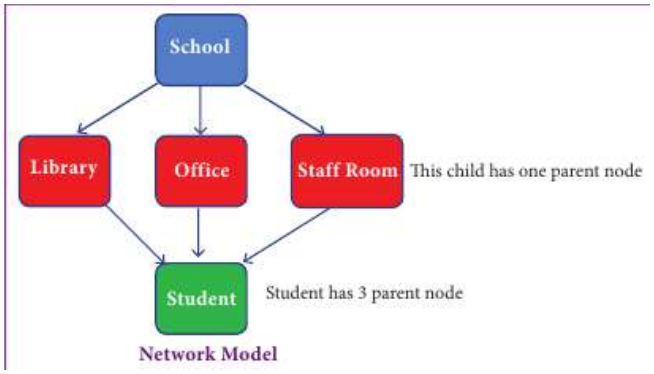
Subj_id	Name	Teacher
1	C++	Kannan
2	Php	Ramakrishnan
3	Python	Vidhya

Stu_id	Subj_id	Marks
1	1	92
1	2	89
3	2	96

Relational Model

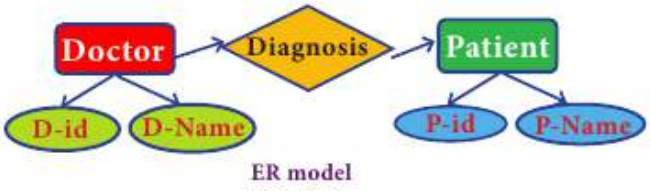
iii.) Network Model

- Network database model is an extended form of hierarchical data model.
- In a Network model, a child may have many parent nodes.
- It represents the data in many-to-many relationships.
- This model is easier and faster to access the data.



iv.) Entity Relationship Model. (ER model)

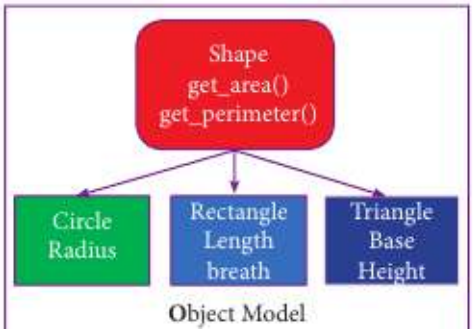
- In this database model, relationship are created by dividing the object into entity and its characteristics into attributes.
- It was developed by Chen in 1976.
- ER model constructed by,
  - **Rectangle** represents the entities.
  - **Ellipse** represents the attributes .
  - **Attributes** describes the characteristics and each entity.
  - **Diamond** represents the relationship in ER diagrams
  - **Example: Doctor diagnosis the Patient.**



v.) Object Model

- Object model stores the data in the form of objects, attributes and methods, classes and Inheritance.
- This model handles more complex applications, such as Geographic information System (GIS), scientific experiments, engineering design and manufacturing.

Example:



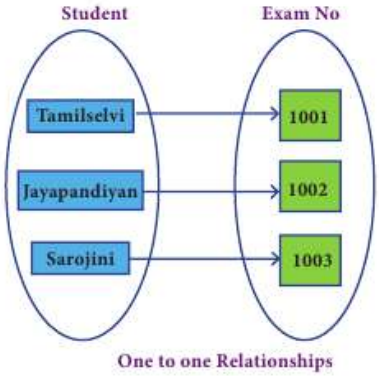
2. Explain the different types of relationship mapping.

Types of Relationships : There are the types of relationships used in a database.

1. One-to-One Relationship
2. One-to-Many Relationship
3. Many-to-One Relationship
4. Many-to-Many Relationship

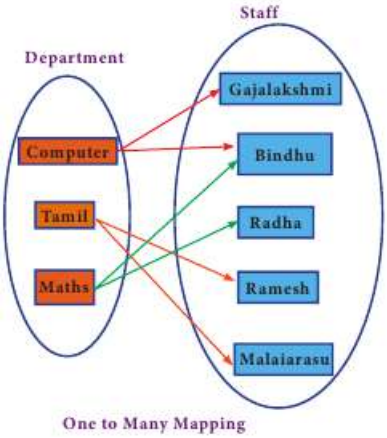
i.) One-to-One Relationship:

- In One-to-One Relationship, one entity is related with only one other entity.
- One row in a table is linked with only one row in another table and vice versa.
- **For Example:** A student can have only one exam number.



ii. One-to-Many Relationship:

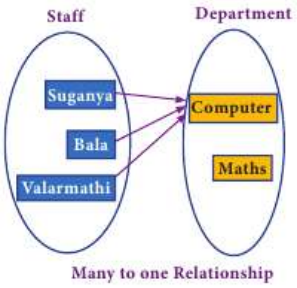
- In One-to-Many relationship, one entity is related to many other entities.
- One row in a table A is linked to many rows in a table B, but one row in a table B is linked to only one row in table A.
- **For Example:** One Department has many staff members.



One to Many Mapping

iii. Many-to-One Relationship:

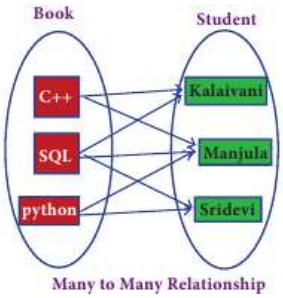
- In Many-to-One Relationship, many entities can be related with only one in the other entity.
- **For Example:** A number of staff members working in one Department.
- Multiple rows in staff members table is related with only one row in Department table.



Many to one Relationship

4. Many-to-Many Relationship:

- A many-to-many relationship occurs when multiple records in a table are associated with multiple records in another table.
- **Example: Books and Student :**Many Books in a Library are issued to many students.



Many to Many Relationship

3. Differentiate DBMS and RDBMS.

Basis of Comparison	DBMS	RDBMS
Expansion	Database Management System	Relational DataBase Management System
Data storage	Navigational model ie data by linked records	Relational model (in tables). ie data in tables as row and column
Data redundancy	Exhibit	Not Present
Normalization	Not performed	RDBMS uses normalization to reduce redundancy
Data access	Consumes more time	Faster, compared to DBMS.
Keys and indexes	Does not use.	Used to establish relationship. Keys are used in RDBMS.
Transaction management	Inefficient, Error prone and insecure.	Efficient and secure.
Distributed Databases	Not supported	Supported by RDBMS.
Example	Dbase, FoxPro.	SQL server, Oracle, mysql, MariaDB, SQLite.

4. Explain the different operators in Relational algebra with suitable examples.

- Relational Algebra is used for modeling data stored in relational databases and for defining queries on it.
- Relational Algebra is divided into various groups.

1) Unary Relational Operations

- SELECT (symbol : σ)
- PROJECT (symbol : Π)

2) Relational Algebra Operations from Set Theory

- UNION (∪)
- INTERSECTION (∩)
- DIFFERENCE (−)
- CARTESIAN PRODUCT (X)

- **SELECT (symbol : σ)**

- General form σ_{c} (R) with a relation R and a condition C on the attributes of R.

- The SELECT operation is used for selecting a subset with tuples according to a given condition.
- Select filters out all tuples that do not satisfy C.
- **Example:** σ_{course} = "Big Data" **(STUDENT)**

- **PROJECT (symbol : Π)**

- The projection eliminates all attributes of the input relation but those mentioned in the projection list.
    - The projection method defines a relation that contains a vertical subset of Relation.

- **Example:** Π_{course} (STUDENT)

- **UNION (Symbol :∪)** **A** ∪ **B**

- It includes all tuples that are in tables A or in B.
- It also eliminates duplicates.
- Set A Union Set B would be expressed as A ∪ B

- **SET DIFFERENCE (Symbol : -)**

- The result of A – B, is a relation which includes all tuples that are in A but not in B.
- The attribute name of A has to match with the attribute name in B.

- **INTERSECTION (symbol : ∩) A ∩ B**

- Defines a relation consisting of a set of all tuple that are in both in A and B.
- However, A and B must be union-compatible.

- **PRODUCT OR CARTESIAN PRODUCT (Symbol : X)**

- Cross product is a way of combining two relations.
- The resulting relation contains, both relations being combined.
- This type of operation is helpful to merge columns from two relations.
- A x B means A times B, where the relation A and B have different attributes.

5. Explain the characteristics of DBMS.

1. Data Stored in a Tables	• Data is stored into tables, created inside the database. • DBMS also allows to have relationship between tables.
2. Reduced Redundancy	• Unnecessary repetition of data in database was a big problem. • DBMS follows Normalisation which divides the data in such a way that repetition is minimum.
3.Data Consistency	• Data Consistency means that data values are the same at all instances of a database.
4.Support Multiple user and Concurrent Access	• DBMS allows multiple users to work on it(update, insert, delete data) at the same time and still manages to maintain the data consistency.
5.Query Language	• DBMS provides users with a simple query language, using which data can be easily fetched, inserted, deleted and updated in a database.
6. Security	• The DBMS also takes care of the security of data, protecting the data from unauthorized access. • Creating user accounts with different access permissions we can easily secure our data.
7. DBMS Supports Transactions	• It allows us to better handle and manage data integrity in real world applications where multi-threading is extensively used.

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