Toppersnotes
Unleash the topper in you

UGC-NET

Computer Science & Application

NATIONAL TESTING AGENCY (NTA)

PAPER – 2 || VOLUME – 2

DATABASE MANAGEMENT SYSTEMS,
SYSTEM SOFTWARE AND OPERATING SYSTEM,
SOFTWARE ENGINEERING,
DATA STRUCTURES AND ALGORITHMS

SIERRA INNOVATIONS

Index

Unit 4: DATABASE MANAGEMENT SYSTEMS

Unit 5: SYSTEM SOFTWARE AND OPERATING SYSTEM

Unit 6: SOFTWARE ENGINEERING

Unit 7: DATA STRUCTURES AND ALGORITHMS

Database Management Systems

is a software for storing & retreiving user's data while considering appropriate security measures.

DBMS supports multi-user environment that allow users to access & manipulate data in parallel

Popular DBMS S/W –

1) MySQL
2) SQLite
3) MS Access
4) dBase
5) Oracle
6) MariaDB etc

Application –

1) Banking
2) Airlines
3) Universities
4) Finance
5) manufacturing etc

Types –

* Hierarchical DB
* Network DB
* Relational DB
* Object – Oriented DB

Disadvantage –

1) Cost of its H/W & S/W is very high
2) Failure of data because of electric failure
3) Complex system so its training is required.

Data Modeling

Database model shows the logical structure of a DB including relationships & constraints.

Types –

(1) Hierarchical DB model
(2) Relational model
(3) Network model
(4) Object - oriented DB model
(5) Entity - Relationship Model
(6) Document model
(7) Entity - attribute value model
(8) Star schema
(9) Object - relational model

⇒ Relational Model –

- it sorts data into table, also known as relations that consist of rows & columns.
- Each row is called tuple
- also used in one-to-one, one-to-many & many-to-many relationships
- written in SQL (Structured Query Language)

⇒ Hierarchical Model –

- it organizes data into a tree-like structure, where each record has a single parent or root.
- Sibling records are sorted in a particular order.
- it is good for describing many real-world relationships.

⇒ Network model –

- based on hierarchical model by allowing many-to-many relationships b/w linked records, implying multiple parent records.

⇒ Object-oriented DB model –

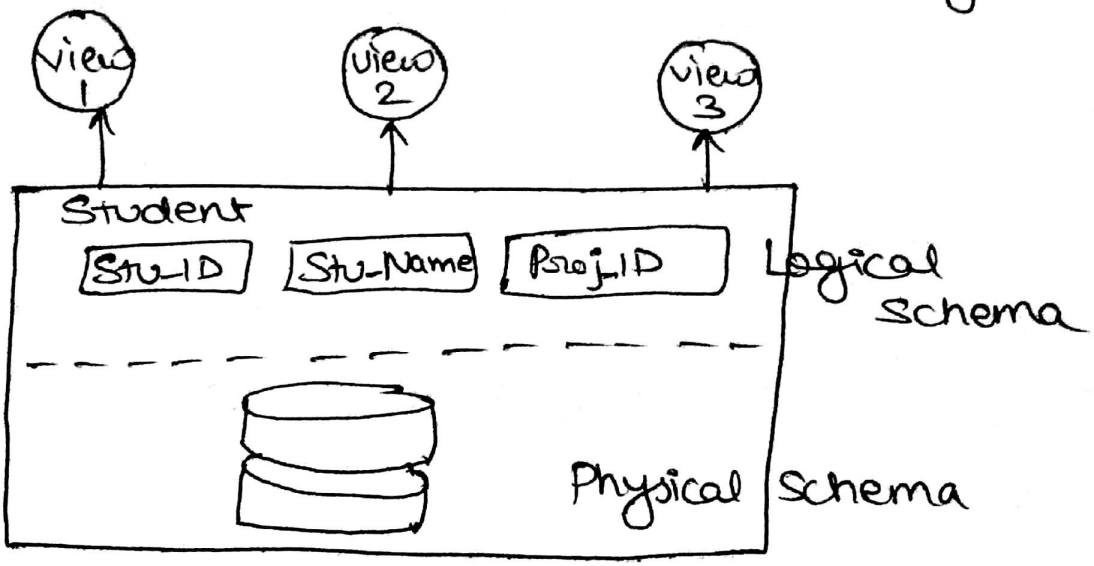
- it defines a db as a collection of objects or reusable s/w elements with associated features & methods.

⇒ Entity-Relationship Model –

- it captures the relationships b/w real world entities much like the n/w model.
- relationship b/w entities are mapped well,
- its common form of ER is star schema, in which central fact table connects to multiple dimensional tables.

Schema — is a skeleton structure that represents the logical view of the entire database.

- it defines how the data is organized & how relations among them are associated.
- it defines table entities & relation among them.
- it is the responsibility of DB designer.



1) Physical Schema

- it pertains to actual storage of data & its form of storage like files, indices etc.
- it defines how data will be stored in secondary storage.

(2) Logical Schema -

- define all logical constraints that need to be applied on the data stored. It defines tables, views & integrity constraints

Instances —

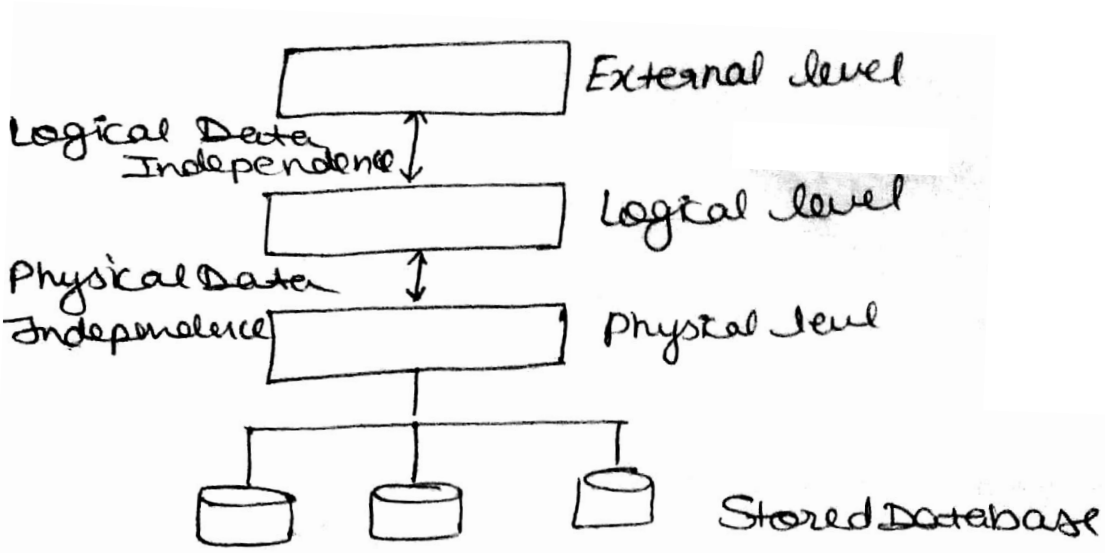
- a state of operational DB with data at any given time
- it contains a snapshot of DB.
- DBMS ensures that its every instance (state) is in a valid state.

Data Independence —

- can be explained using three-schema architecture.
- it refers to characteristics of being able to modify the schema at one level of the database system without altering the schema at the next higher level.

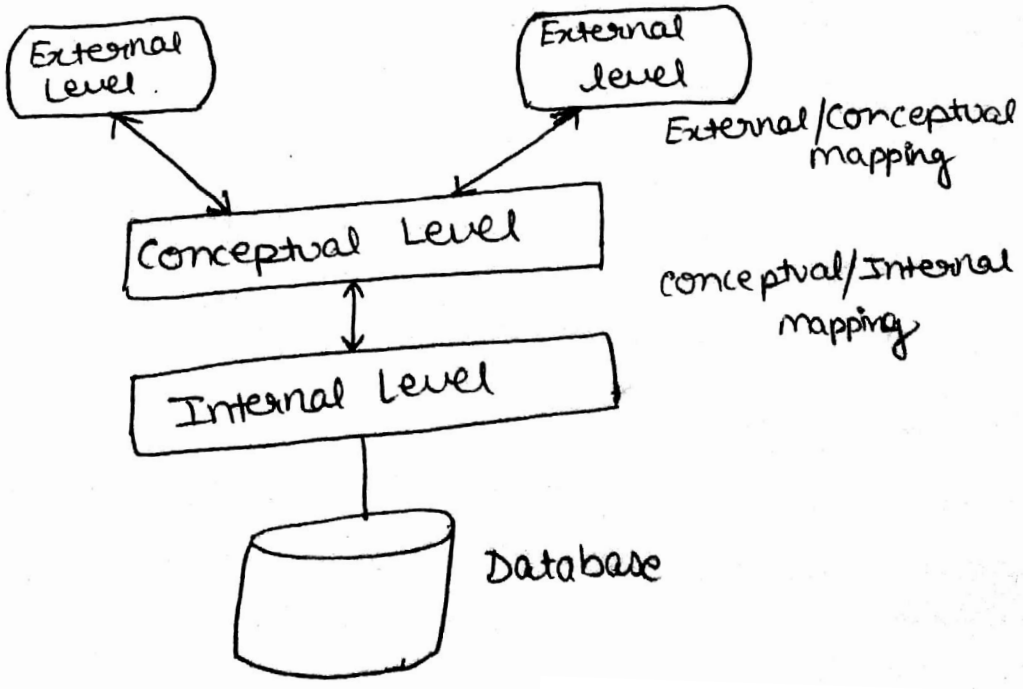
Types -

1) Logical data independence
2) Physical data independence.



Three Schema Architecture

- it is also called ANSI/SPARC architecture
- this framework is used to describe system
- also used to separate user applications & physical database
- it breaks a database into three different categories.



1) of three - schema architecture shows the DBMS architecture.

2) Mapping is used to transform the request & response b/w various db levels of architecture.

3) Mapping is not good for small DBMS because it takes more time.

4) In External / conceptual mapping, it is necessary to transform the request from external level to conceptual schema.

5) In conceptual / internal mapping, DBMS transform the request from the conceptual to internal level.

⇒ Internal level - Internal level has an internal schema which describes the physical storage structure of the DB.

→ The internal schema is also known as a physical schema

→ It uses the physical data model. It is used to define that how the data will be stored in a block

→ its physical level is used to describe complex low-level data structures in detail.

Conceptual Level -

- it describes the design of a database at the conceptual level
- also known as logical level.
- it describes what data are to be stored in the database & also describes what relationship exists among those data.
- implementation of data structure & other internal details are hidden
- Programmers & database administrators work at this level.

⇒ External level -

- at this level, a database contains several schemas that sometimes called subschema.
- it is used to describe different view of the database.
- also called view schema.
- it describes the end user interaction with database systems

Q In three-tier architecture, the intermediate layer b/w database & client servers is classified as application server.

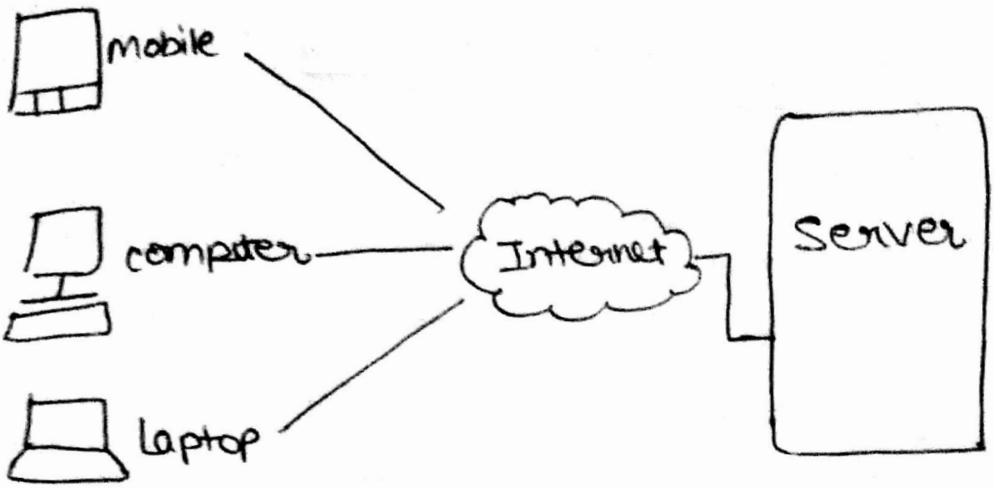
Q When the primary key is null of the new tuple then the constraints violated is entity integrity constraints

Q In three-tier architecture, the intermediate layer b/w db & client servers is ~~called~~ called application server.

Client-Server DBMS architecture:

1) Server hosts (computer) send & manages most of the resources & works to be required by the client

- It has one or more client computers attached to a central server over a n/w
- also called networking computing model because all the requests & demands are sent over a n/w.



- here many clients request & receive service from a centralized server.
- Client computer provide an interface to allow a computer user to request services of the server & to display the results the server returns.

eg in hospital data processing

- mostly used in business applications
- Client & Server machines need different amount of h/w & s/w resources
- its applications interact directly with a TCP to establish communication & to send or receive information.

Centralized architecture -

- this type of system is stored at a single location such as main frame computer
- its connections are accessed using LAN/WAN.
- Basically used by organisations such as colleges, companies, banks etc.

Advantages -

- Data integrity is maximised as whole database is stored at a single physical location.
- Data redundancy is minimal.
- Stronger security
- Cheaper ∵ of only one setup
- All the information can be easily accessed from the same location & at the same time

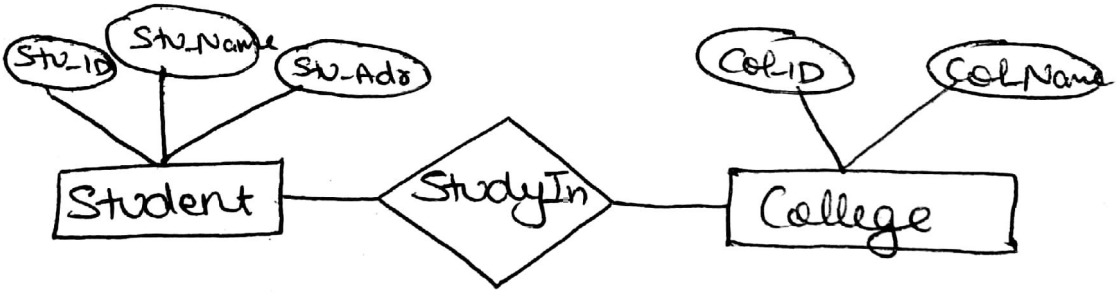
Disadvantages -

- it takes more time to search & access the data ∵ all the data is at one location.
- reduce efficiency of system ∵ all the data is stored at same location.
- if there is no database recovery measure in place & a system failure occurs, then all the data in database will be destroyed.

Entity Relationship Diagram

- it describes the structure of a database with the help of diagram i.e ER diagram
- it shows the relationship among entity sets. entity set is a group of similar entities & these entities have attributes.

eg



- Rectangle = Entity set
- Ellipses = Attributes
- Diamonds = Relationship Set
- Lines = They link attributes to Entity Sets & entity sets to relationship set
- Double Ellipses = Multivalued attributes
- Dashed Ellipses = Derived attributes
- Double Rectangles = Weak entity sets
- Double lines = Total participation of an entity in a relationship set

Components of ER Diagram -

- **Entity**
  - weak entity
- **attribute**
  - key
  - Composite
  - Multivalued
  - Derived
- **Relationship**
  - one to one
  - one to many
  - many to one
  - many to many

⇒ **Entity** - is an object of data.

eg 

in this ER diagram we have two entities Student & college & these two entities have many to one relationship.

⇒ **attribute** - describes the property of an entity.

⇒ **Relationship** - it shows relationship b/w entities.

PYQ Gate Exam (ERD)

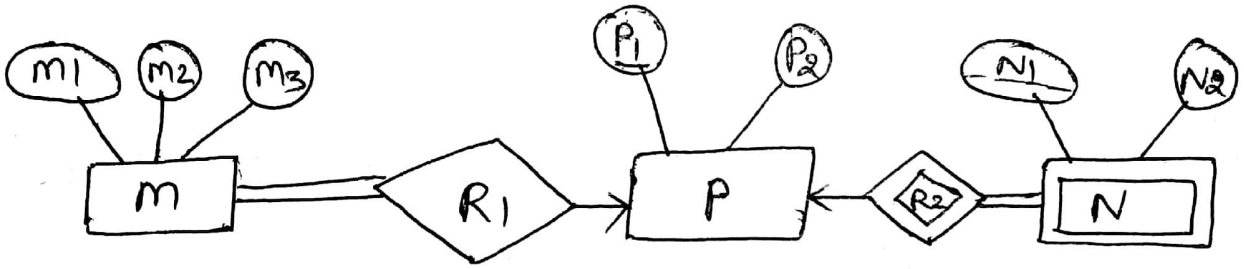
Q) In an Entity - Relationship (ER) model, suppose R is a many-to-one relationship from entity set E1 to entity set E2. Assume that E1

& E2 participate totally in R & that the cardinality of E1 is greater than the cardinality of E2

which one of the following is true about R?

sol Every entity in E1 is associated with exactly one entity in E2.

Q2 Consider the following ER diagram



The minimum no. of table needed to represent M, N, P, R1, R2 is

sol 3

Q3 Based on this ER diagram find the correct attribute set for one of the tables for the correct answer to the Q2.

sol {M1, M2, M3, P1}

Q4 Which of the following statements related to ER model is incorrect?

sol 1) An attribute of an entity can have more than one value.

2) An attribute of an entity can be composite

3) In a row of a relational table, an attribute can have more than one value.

4) In a row of a relational table, an attribute can have exactly one value or a NULL value.

only option (3) is incorrect

Q5 ER modeling is primarily used for

sol Designing databases

Q6 An attribute which can have many values for a single entity is called as

sol Multivalued attribute

Q7 The first step in database design is

sol Requirement gathering & Analysis

Q8 DML is a language that enables users to

sol Insert data into the database