Govt Polytechnic Darbhanga

Semester IV

DBMS Notes

sub Code (1618403)

By Prof. D N Singh

CSE Department

DR. B K Roy

Principal

Govt. Polytechnic Darbhanga

DBMS

Data :- Data is the raw material that can be processed for any computing machine eg :- employee name, product name, name of the student, marks of the student, any number, image

Information :- It is the data that has been converted into more useful or intelligable form eg report card sheet

Why we need information

1) To gain knowledge about the surroundings
2) To keep the system upto date
3) To know about the rules and regulation of the society

Knowledge :- Human mind purposefully organise the information and evaluate it to produce knowledge eg 238 is a data and Marks of student is information and the hard work require to get mark is knowledge

Knowledge

Fact Based Heuristic Based

1) Fact Based :- The knowledge gain from fundamental & through experiment

2) Heuristic Based :- It is the knowledge of good practice

Date

and good judgement like hypothesis

Difference between data and information

	Data	Information
①	Data is the raw fact	It is the processed form of data
②	It is not significant to a buisness	It is significant to a buisness
③	Data are Atomic level piece of information	It is a collection of data
④	Data doesnot help in decision making	It help in decision making
⑤	eg:- product name, Name of Students	eg report Card Sheet

Database:- The related information when placed in an organised form makes a database or an organised collection of related information is known as database eg Dictionary, Telephone Directory, Mobile Contact

Operation perform on Database

1) Insertion
2) Updation
3) Deletion
4) Retrive
5) Sorting

Difference between Computerised databases and manual databases

Passion
Page No.
Date

Traditional File System :-

File System :- A file system is the method of storing and organising the computer files and the data they contain to make it easy to find and access them

Characteristic of files system :-

1) It is a group of files for storing the data of an organisation
2) Each file is independent from one another
3) Each file is called a flat files
4) Files are design by using the program written in programing language such as c, c++

Limitation / Disadvantages of File processing system :-

1) Seperated and isolated data
2) Duplication of data :- i) It cost time and money
   ii) It takes up additional storage space
   iii) It can lead to loss of data integrity
3) Data dependencies :- files and record were describe by specific physical format that were code in the application program by the programs
4) Difficulty in representing the data from the user point of view
5) Data security :- The security of data is low in the file based system because the data is maintain in a flat file is easy accessible

6) Transactional problems :- This System does not satisfy transactional properties called ACID properties A → Atomicity, C → Consistency I → Insolation, D → Durability

7) Concurrency problems :- When multiple user access a same piece of data at a same interval of time then it is called as Concurrency of System. When two or more user read the data simultaneously then their is no problem but when they like to update the file simultaneously It may result in a problem

Building Block of Database :-

1) Column / fields
2) Rows / tulple / Record
3) Tables

DBMS (Data Base Management System) :- It is the Software System that allow the User to define, to create and maintain the database and provide control access to the data

Application of Database :-

i) Library System
2) Banking System
3) ATM

Database :- Mysql, oracle, sql server, DB2, Microsoft Access

Components of DBMS :-

1) Hardware :- The hardware is the actual computer system used for keeping and accessing the database Conventional DBMS hardware consist of secondary storage devices such as harddisk. Database run on the range of machine from micro computers to main frames

2) Software :- Software is the actual DBMS between the physical Database and the users of the system All the request from the user for accessing the database are handled by DBMS

3) Data :-

4) Users :- There are no of users who can access or retrieve the data on demand using the application and the interfaces provided by the DBMS
The Users of the database can be classified into the following groups.

1) Naive Users
2) Online users
3) Sophisticated users
4) Specialized Users
5) Application programmers
6) DBA - Database Administrator

① Naive Users :- Those user who need not be aware of the presence of the database system. They are the end users of the database who

Page No.
Date

work through a menu driven application programs, where the type and range of response is always indicated to the users

2) Online Users:- Those users who may communicate with database directly through an online terminal or indirectly through user interface and application program.

3) Sophisticated User:- They are those user who interact with the system without writting the program. Instead they form their request in database query language.

4) Specialized User:- Those users who write specialized database application that donot fit into the fractional database processing framework.

5) Application Programmer:- Those users who are responsible for developing the application programs or user interface. The application programs could be written in high level language.

6) DBA - Database Administrator:- It is a person or the group incharge for implementing the database system within the organisation. The DBA has all the privilage allowed by the DBMS and can assign or remove the privilages from the users

5) Procedure :-

Disadvantages of DBMS :-

1) Complexity :-
2) Size
3) Performance
4) Higher impact of failure
5) Cost of DBMS

Differentiate between File Management System & DBMS.

* Master file :- Master file are those file which remain static. There is no change

- Transaction File :- Transaction file are those file which is dynamic in nature. We can made changes

- Instances :- The situation data in the database at a particular moment of time is called an instance

- Schema :- The overall design of the database is called Schema OR Description of database.

- Subschema :- It is the subset of the schema and inherit the same property that a schema has. It gives the users a window through which he/she can view only that part of database which is of interest to him.

Passion
Page No.
Date

Architecture of DBMS :-

There is 3 level

1) External level
2) Conceptual Level
3) Internal Level

Objective of three Level Architecture or Sparc 3level Architecture :-

The objective is to seperate each users view of the data from the way the database is physically represented.

There are Several reasons

1) The internal structure of the database should be uneffected while changes to the physicall aspects of storage
2) The DBA should be able to change the conceptual structure of the database without affecting all othess users

1) External level | viewlevel :- This level describes that part of the database that is relavent to each users. This level insulates the users from the details of conceptual and the internal level.

2) Conceptual level | logic level :- This level describe what data is stored into the database and the relationship among the data.

It represents :-

(a) All the Entities, attributes and there relation -ships
(b) The constraints on the data

c) Security and Integrity information /Storage Level

3) Internal level:- It is the physical representation of the database on the computer. This level describe How the data is stored in the database. It covers the data structures and file organisation used to store the data on storage devices.

Schemas:-
1) External Schema
2) Conceptual Schema
3) Internal Schema

1) External Schema:- The external view is described by means of a schema called External Schema. That corresponds to differents view of the data

2) Conceptual Schema:- The conceptual view is defined by Conceptual Schema, which describes all the entities, attributes and their relationship with the integrity constraints

3) Internal Schema:- Internal level is defined by internal Schema, which is a complete description of the internal model

There is only 1 Conceptual Schema and 1 internal Schema per database and more than 1 external Schema

Schema is also known as Intension.

NOTE: Instance / Extension of database

Mapping between the levels:
1) External / Conceptual Mapping
2) Conceptual / Internal Mapping

1) External / Conceptual Mapping: Each external Schema is related to the conceptual Schema by external conceptual Mapping. This Mapping gives the correspondance among the records and the relationships of the external & Conceptual Views. There is a mapping from a particular logical record in the external View to one or more conceptual record in the Conceptual View.

2) Conceptual / Internal Mapping: Conceptual Schema is related to Internal Schema by Conceptual Internal Mapping. Mapping between the Conceptual and Internal level Specify the method of deriving the Conceptual Record from physical database

Data Independence:
1) Logical data independency
2) Physical data independency

1) Logical data independency: It indicates that the Conceptual Schema can be changed without effecting the existing external schema. The changes would be absorbed by the mapping

between external and conceptual level

2) Physical data independency:- It indicates that the physical storage structure or devices can be changed without effecting the conceptual schema. The change would be absorded by the conceptual internal mapping.

→ Logical data independency is much more difficult to achieve than Physical data independency as it requires the flexibility in the design of the database and programer has to see the future requirement or modification in the design.

θ Limitation of file processing system:-

1) Separated and Isolated Data:- To make a decision, a user might need data from two separate files. First the files were evaluated by analysts and programmers to determine the specific data required from each file and the relationship between the data and then application could be written in a programming language to process and extract the needed data.

2) Difficulty in representing data from the user's View:- To create useful application for the user, often data from various files must be combined. In file processing it was difficult to determine relationships between isolated data in order to meet user application.

Components of DBMS:-

- Data:- It is the most important component of DBMS environment from the end users point of view.
One of the major features of database is that actual data are separated from the programs that use the data. A database should always be designed, built and populated for a particular audience and for a specific purpose.

- Procedures:- Procedures refer to the instructions and rules that govern the design and use of the database. The user of the system and the staff that manage the database require documented procedures on how to use or run the system.

Disadvantages of DBMS:-

1) Complexity:- The provision of the functionality that is expected of a good DBMS makes the DBMS an extremely complex piece of software. Database designers, developers, database administrators and end-users must understand this functionality to take full advantage of it. Failure to understand the system can lead to bad design decisions, which can have serious consequences for an organization.

Page No. Passion
Date

2) Size:- The complexity and breadth of functionality makes the DBMS an extremely large piece of Software, occupying megabytes of disk space and requiring substantial amount of memory to run efficiently.

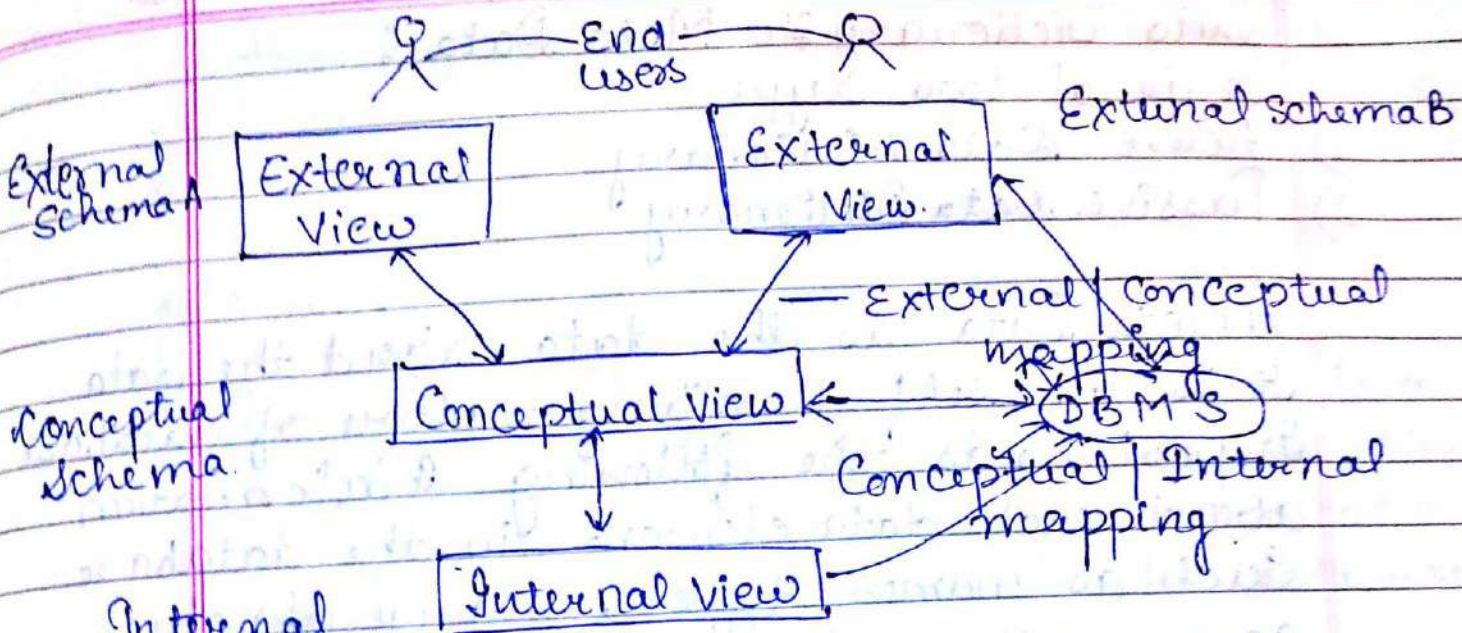
3) Performance:- A file Based System is written for a specific application such as invoicing. As result performance is generally very good. However the DBMS is written to be more general, to cater for many application rather than just one.

4) Higher impact of a failure:- The centralization of resource increases the vulnerability of the system. Since all user and applications rely on the availability of the DBMS, the failure of any component can bring operation to a halt.

5) Cost of DBMS:- The cost of DBMS varies significantly depending on the environment and functionality provided. There is also the recurrent annual maintenance cost.

Passion
Page No.
Date

File Management eg C++ or COBOL Program	Database Management eg oracle or Sybase
1) Small System	1) Large System
2) Relatively cheap	2) relatively expensive
3) few files	3) many files
4) files are files	4) files not necessarily files
5) Simple Structure	5) Complex Structure
6) little preliminary design	6) Vast preliminary design.
7) integrity left to application programmer	7) rigorous inbuilt integrity checking
8) no security	8) rigorous Security
9) Simple, primitive backup/recovery	9) Complex & Sophisticated backup/recovery
10) often Single User	10) multiple user



Role of DBA (Database Administrator.) :- It is a person or group incharge for implementing DBMS in an organisation. The DBA job requires high degree of technical expertise DBA consist of a team of people rather than just one person

Responsibilities of DBA :-

1) Makes the decision concerning the content of the database
2) Plans the storage structure and access strategy
3) Provides the support to the users
4) Defines the security and integrity checks
5) Interprets backup and recovery strategies
6) Monitoring the performace and responding to the changes in the requirements

Data Dictionary or Meta Data :-
It is of two type
1) Active Data Dictionary
2) Passive Data Dictionary

A Meta Data is the data about the data
It is the self describing nature of database
It part holds the following information about each data element in the database such as names, types, range of values access authorization, inolicate which application program uses the data
Meta Data is used by the developers to develop the program, queries to manage and manipulate the data

Dictionary:-
1) Active Data, It is manage automatically by the data management software. It is always consistent with the current structure of the Database.

2) Passive Data Dictionary:- It is the one use for documentation purposes. It is managed by the user of the system and is modified manually by the users.

Database Languages :-

(1) Data Defination Language (DDL) :- It is a language that allows the user to define the data and there relationship to

other type of data. Command are
1) Create
2) Alter
3) Rename
4) Drop

2) Data Manipulation language (DML) :- It is a language that provides a set of operation to support the basic data manipulation, operation on the data held in the database. Command used are :-
1) Insert
2) Delete
3) Select
4) Update

3) Data Control Languages (DCL) :- Command are :-
1) GRANT
2) REVOKE

Data Models :- There are three type of data Models
1) Object based
2) Record based Logical models
3) Physical Based

It can be define as an integrated collection of concepts for describing and manipulating the data, relationships between the data and Constraint on the data in an organisation.
It comprises of three component
1) Structural part :- There are rule which help in designing model

2) Manipulative part :- which type of operation is apply on model

3) Integrity Rules :-

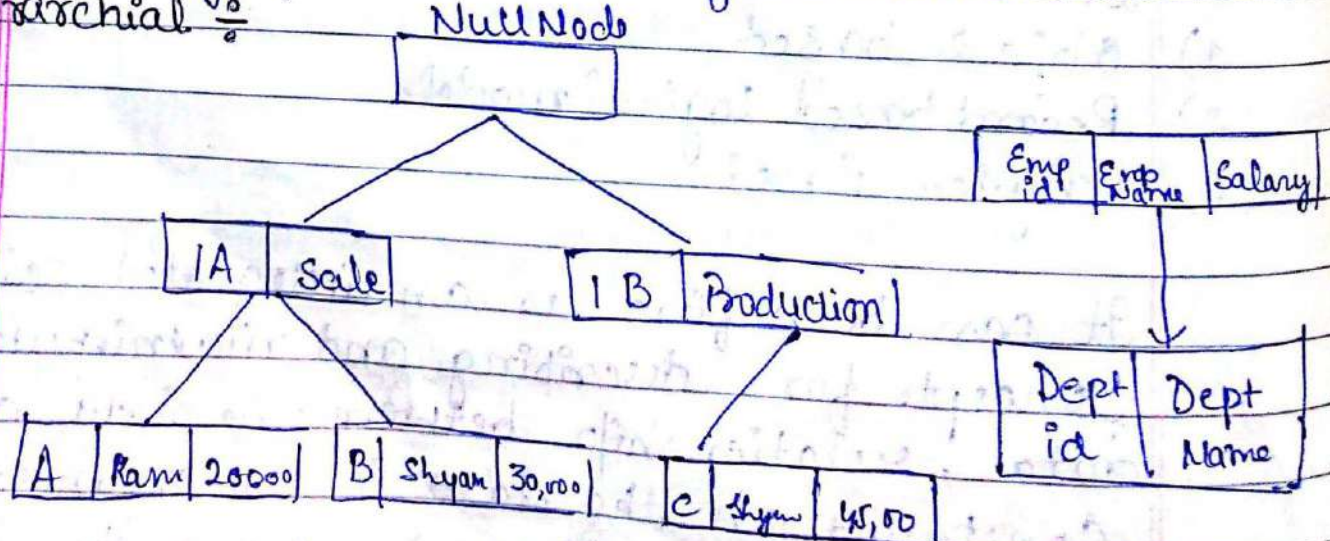
Data model are divided into three category

1) object based :- It uses a concept such as entities, attribute and there relationship. This model can be used to describe the data at the Conceptual and External level Eg E-R models

2) Physical based :- These model describe how the data is stored in the Computer. This model is used to describe the data at the internal level.

3) Record based logical models :- These models are used in describing the data at the logical and the view level. These models are used to Specify the over all logical structure of the database

Eg of Hierarchial :-



1) Hierarchial model:-

It is based on tree structure. It consist of collection of records that are connected to each other by links. The tree structure use in a Hierarchial model is known as routed tree. The root node of that tree is an empty node. So Hierarchial model is a collection of routed trees and the relationship exists in the Hierarchial model is one to many and ~~many~~ one to one.

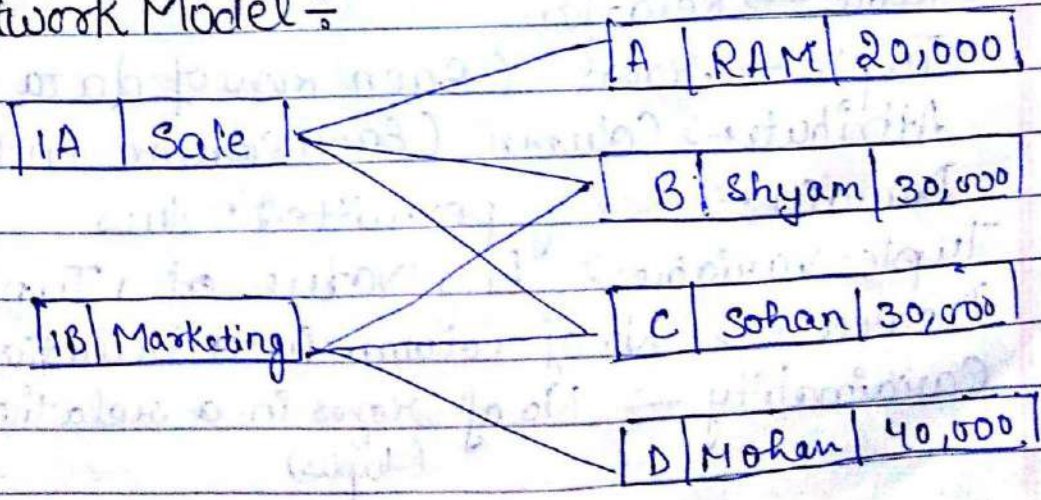
Advantages:-

1) It is easy to understand.
2) More efficient than ER model

Disadvantage:-

1) Data inconsistency occur when the parent node is delete that result in the deletion of the child node.
2) Wastage of storage space
3) Complex to design
4) Absence of structural independency

2) Network Model:-



for one to many →
one to one ↔
many to many ←

It is based on Graph Structure. It consist of collection of records, which are connected to each other by links.

Advantage:-
1) It is eddy to design than the Hierarichial model
2) Data access is easy in the network model

Disadvantages:-
1) It is complex to design than a relational model
2) Efficiency are less than the relational model
3) Absence of structural independency

3) Relational Model:- Relational model stores data in form of tables.

Employee

Emp id	Name	Salary
1	A	20,000
2	B	30,000
3	C	40,000
4	D	50,000

→ Domain

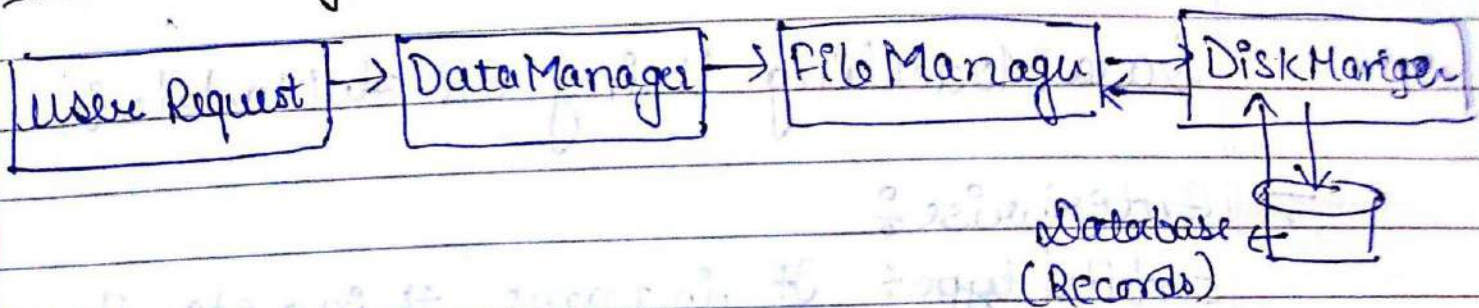
Tuple Variable

Department

Dep id	Name
A	Sales
B	Marketing

Table → Relation
Tuple → rows (Each Row of data)
Attributes → Column. (Each Column in the tuple
Domain → Set of permitted values
Tuples variable → Any value of a Tuple
Degree → No of Column in a relation → 3 in emp.
Cardinality → No of rows in a relation. (4 tuples)

Data Manager %



UNIT-2

- In Relational model many to many relationship can be easily implemented
- It is useful for representing most of the real world object and relationship among them
- Relational model does not maintain physical connection among records. Data is organized logically in the forms of rows and columns and stored in table

Date

UNIT-2

Data Modelling Using ER & Models :-

→ Enterprise :-
Entity type :- It is name, thing etc., These are the data Object about which information is to be collected
Attributes :- characteristic of entity. OR Data elements & Data fields.

Type of Attributes :-

1) Single Value Attributes :- Those attribute which contain a single value. for eg :- Age., Salary etc

2) Multivalued Attribute :- That contain more than one value of a single entity for eg Phone no.

3) Composite Attributes :- Those attribute which can be further divided. for eg name → First name Last name, Date of Birth etc.

4) Simple or Atomic attributes :- Those attributes which can not be further divided for eg Age.

5) Stored Attributes :- Attributes which can not be derived from another attribute Date of Birth

6) Null value :- Empty.

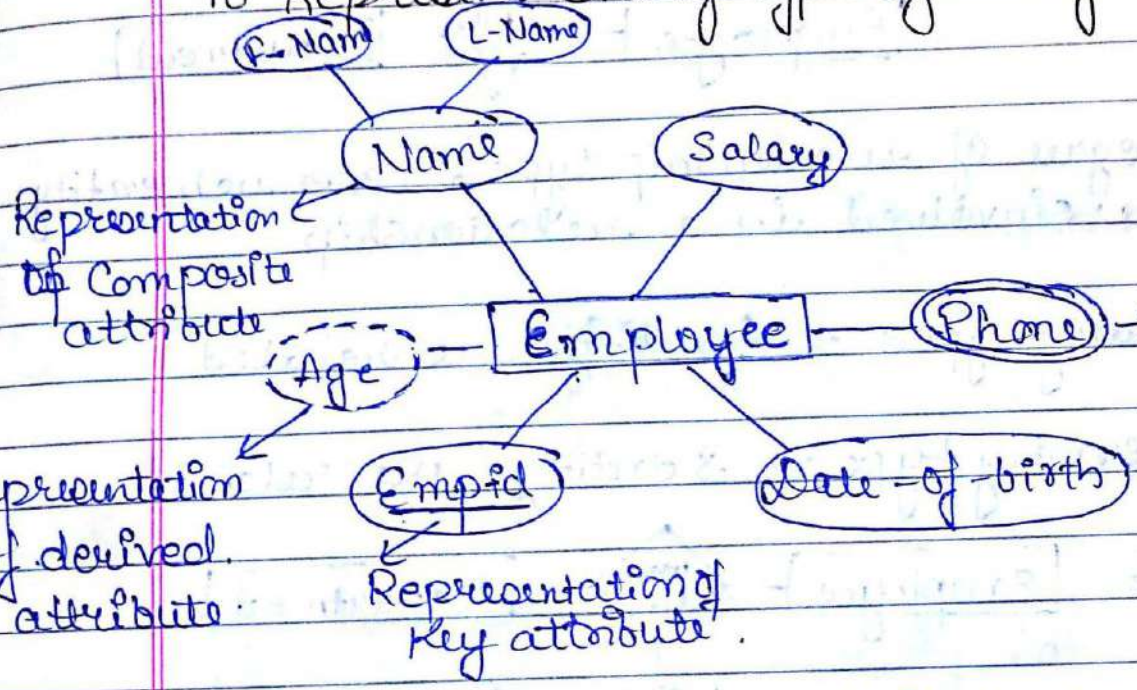
Entity Types :- Collection of Entity that Share the Same attribute.

eg :- Employee → Name, Age, salary.
↓
Entitytype

Entity Set :- Employee — Name, Age, Salary

Entity Set

To Represent Entity Type by using ER diagram.

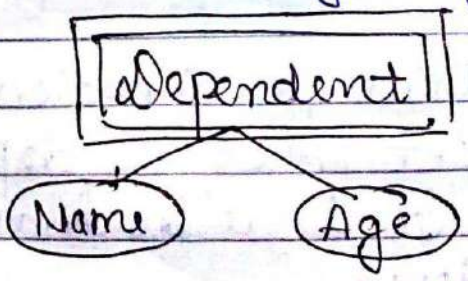


Key attribute :- Key attribute are those attribute which is uniquely identify the record.

Weak Entity type :- In those entity type ~~is~~ which in which no key attributes is present.

Strong Entity type :- Those ~~strong~~ Entity type which consist of key attributes.

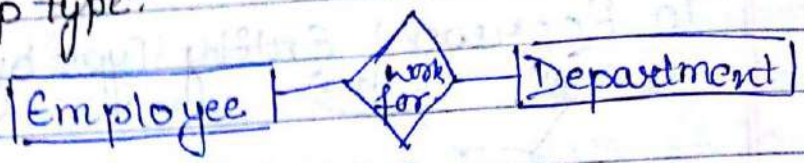
Eg of weak Entity type



Domain of the attributes: Set of possible values.

To join two entities → Relationship: Representation of Relationship

Relationship type:

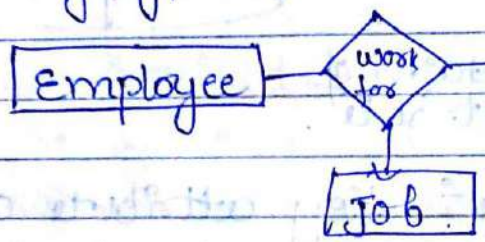


Degree of relationship type: How much entity are involved in a relationship.

1) Binary type → 2 entity are related

2) Ternary type → 3 entity are related

Eg:



Relationship Constraints:
- Participation Constraints
- Cardinality ratio

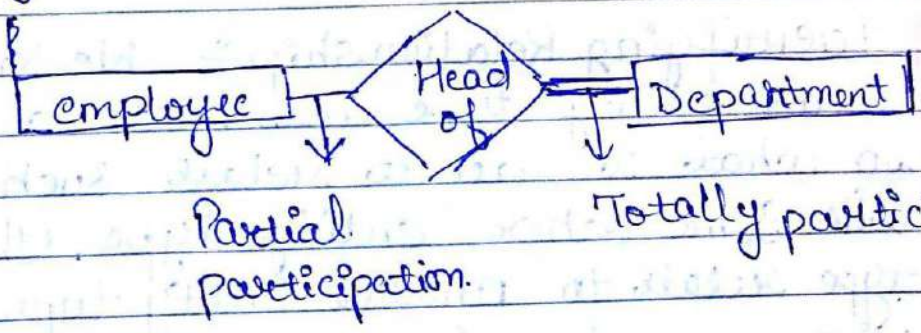
① Participation Constraints

Total participation Partial Participation

① Total Participation: In total participation every entity in the empty set must be depend on another entity. It is also known as existence dependency.

In E-R diagram it is represented as a double line connecting the participating Entity type two the relationship.

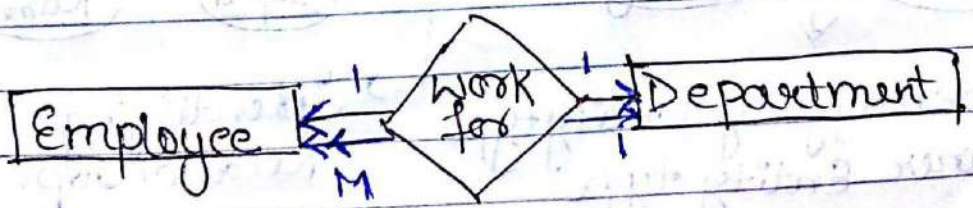
② Partial participation: In partial participation some entities in the entity set are depend upon another entity.

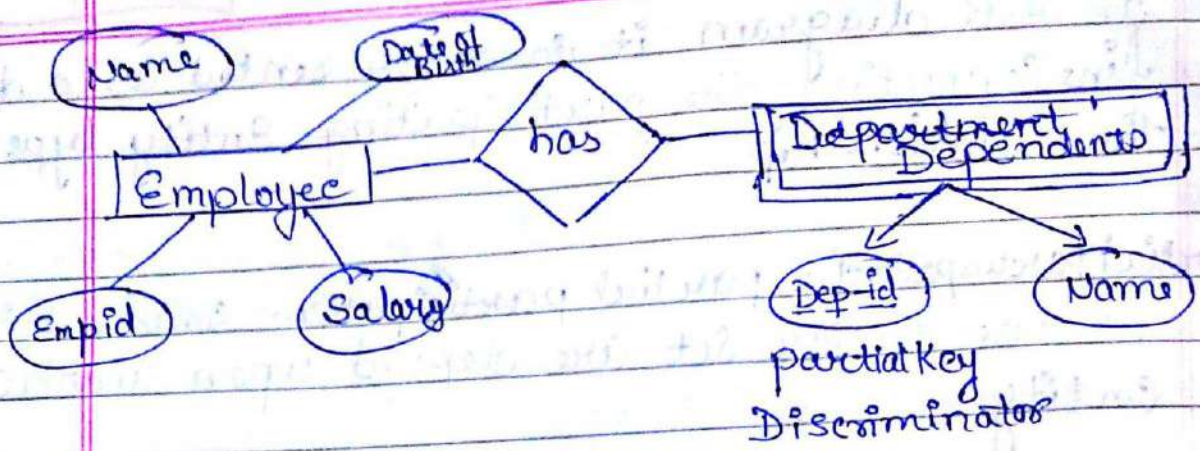


③ Cardinality ration: Cardinality ratio for binary relationship specifies the no. of relation ship instance that an entity can participate in a relation set.

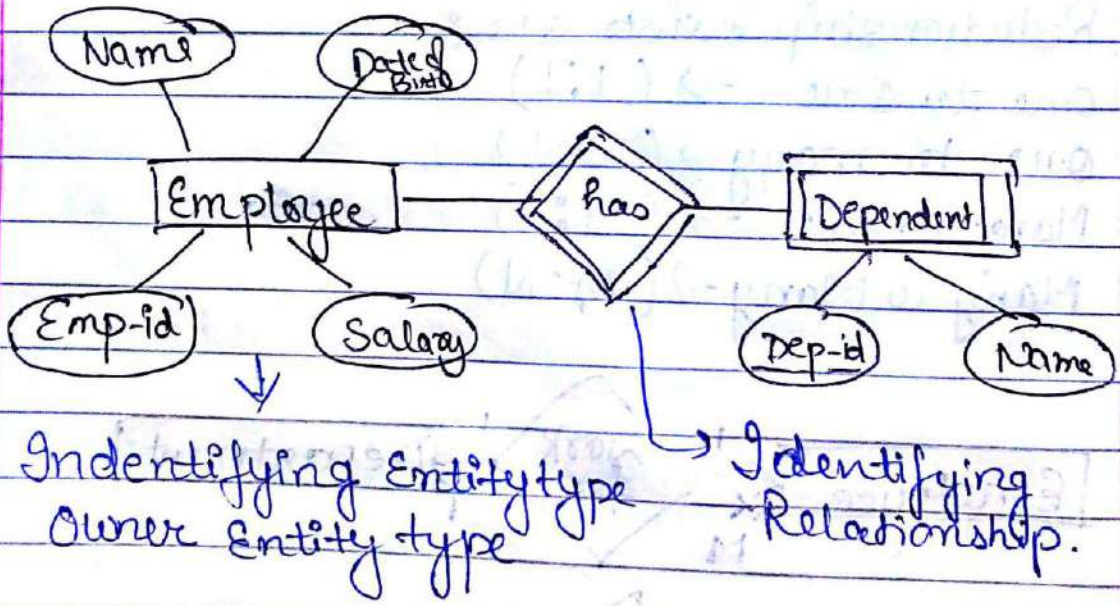
Relationship exists are:
one to one → (1:1)
one to many → (1:N)
Many to one → (N:1)
Many to Many → (M:N)

eg:





→ Identifying Relationship :- We know that a weak entity type does have a key attribute, so what we do to relate such entity type with some other entity type. The weak entity type relate to another entity type in combination with some of their attributes value. We call this other entity type the identifying or the owner entity type and we call the relationship type that relates to its owner the identifying relationship.



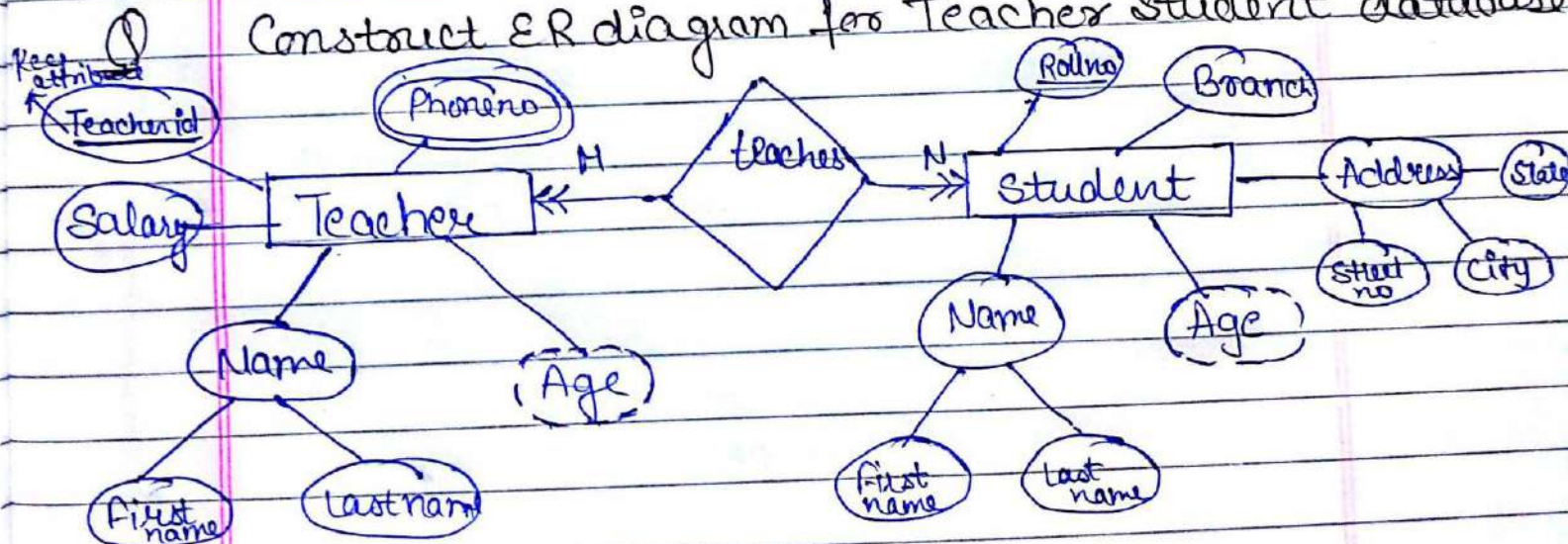
9 Make an E-R diagram of for the company database with the following description

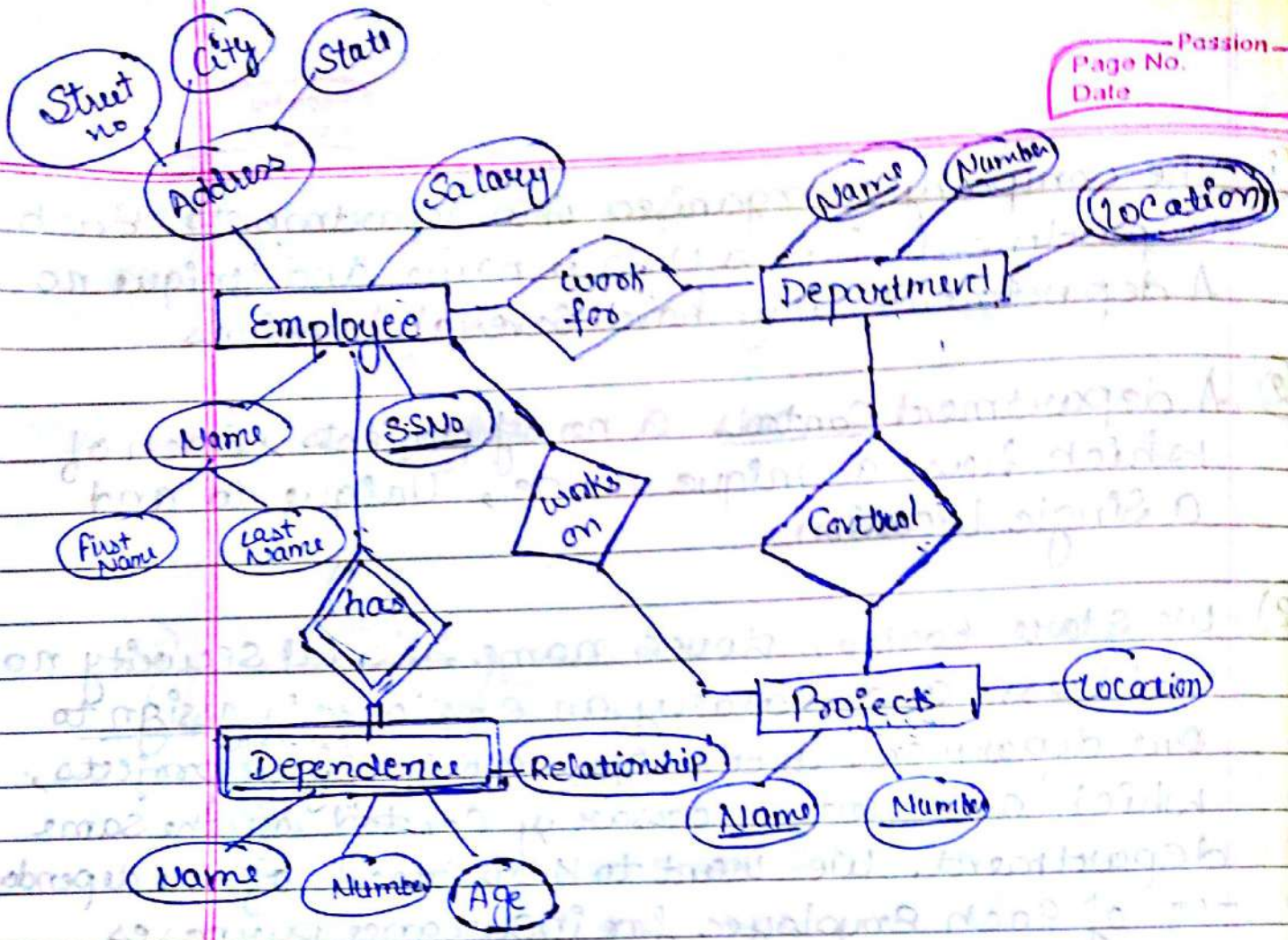
(1) The company is organised into departments. Each department has a unique name and unique no. A department may have several locations

(2) A department controls a no of projects, Each of which has a unique name, unique no and a single location.

(3) We store each employee name, social security no, address and salary an employee is assign to one deparment but may work on several projects, which are not necessarily control by the same department. We want to keep track of the dependen -ce of each Employee for insurance purposes.

Construct ER diagram for Teacher Student database



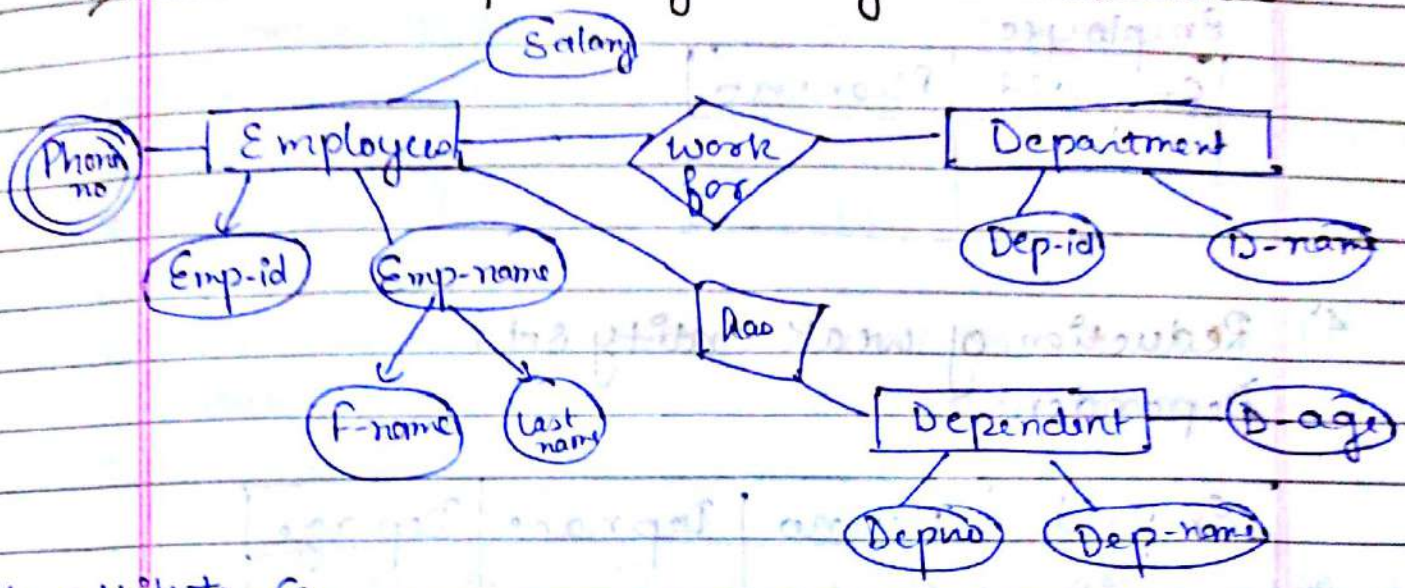


Que Construct an E-R diagram of University system

Page No
Date

Reduction of E-R diagram into table

1) Reduction of Strong entity set into table



Key attribute Eg.

Employee

Emp id	E-name	Salary

Department

Dep-id	Dept name

Reduction of composite attribute into table

Employee

Emp-id	f-name	l-name	Salary

3) Reduction of multivalued attributes
Phoneno

Employee

Emp-id	Phoneno

4) Reduction of weak entity set :
Dependent

Emp-id	Depno	Depname	Dep age

5) Reduction of relationship sets
Work for

Emp-id	Department id

RDBMS. :
3 Components :
- Data Structure
- Data integrity
- Data Manipulation

Candidate key is a subset of Superkey.

Key : It is a set of one or more columns whose combined values are unique among all the

Page No.
Date

① ~~Candidate Key~~ :
occurances in a given table

Types of keys :
1) Candidate key
2) Super key
3) Primary key
4) foreign key
5) Alternate key
6) Artificial key
7) Composite key

1) Candidate Key : They are those attributes of the relational, which have the properties of uniqueness and irreducibility.

a) uniqueness : No legal value of R ever contain two distinct tuples with same values for K.

b) Irreducibility : No proper subset of K has the uniqueness property.

For example if the combination of (Name, Class) is unique, then it can be identified as the candidate key if and only if Name and Class individually are not unique.

2) Super Key : Super key follow the properdy of uniqueness, but not irreducibility.
A Super key has a uniqueness property but not necessarily the irreducibility property.
A candidate key is a special case of a Super key

Page No.
Date

eg:- If Roll-no is unique in relation STUDENT then, the set of attribute (Roll-no, Name, Class) is a Super key for a relation STUDENT, these set of attributes are also unique, but this combination of Key is not having the property of irreducibility

→ Relation of patient in which Patient-number is unique. The patient-number is a candidate key and (Patient-number, Patient name) is a SuperKey.
'A superset of a candidate key is a Superkey.

3) Primary Key:- The primary key is an attribute or a set of attributes that uniquely identify a specific instance of an entity. Primary key cannot contain any null value because we cannot uniquely identify multiple null values. ~~Ea Primo~~ primary key is a candidate which promote by database designer as primary key.

4) Alternate Key:- Exactly one of those candidate keys is chosen as the primary key and the remainder, if any, are then called Alternate Keys. An alternate key is a function of all candidate key minus primary key.

5) Composite keys:- A primary key that is made up of more than one attribute is known as Composite key.

Page No. Passion
Date

Ex:- WORK

Employee ID	Project ID	Hours-Worked
01	01	200
01	02	120
02	01	50
02	03	120
03	03	160
03	04	200

It is subset of superkey.

6) Artificial keys:- An artificial key is one that has no meaning to the business or organization and perform function of a primary key in relation. Artificial key are permitted when
(1) no attribute has all the primary key properties
(2) the primary key is large and complex

eg:-

Enrollment		
Student	Class	row-id
AK		PK

7) Foreign key:- Foreign key are the attributes of the table which refers to primary key of some another table. Foreign key are used to link together two or more different tables which have some form of relationship with each other. These foreign keys is a reference to the tuple of a table from which it was taken. This tuple being called as Referenced or target tuple.

Target Attribute

Foreign key

eg:- Employee

Department → Target table

Emp-id	Name	Salary	Dep-id
1	Abc	30000	10
2	Xyz	40000	20
3	Pqr	50000	30

Dep-id	Dep-Name
10	Sales
20	Market
30	Product

eg:-

Student

Rno	Name	Class-Code
1	A	2
2	B	1
3	C	-

Class

ClassCode	Name
1	B.TECH
2	B.TECH
3	BBA

(2) Data Integrity :- Basically it consist of two rules
1) Entity Integrity Rule
2) Referential Integrity Rule

(1) Entity Integrity Rule :- This rules states that in a relation, the value of the attribute of a primary key can not be null.

(2) Referential Integrity :- It states that if a foreign key exists in a relation, either the foreign key value must match the primary key value of some tuple in its home relation or the foreign key value must be completely null.

Page No.
Date

Employee

Emp-id	Name	Salary	Dep-id
1	A	3000	10
2	B	4000	20
3	C	5000	30
4	D	6000	40

Department

Dep-id	Dept name
10	Sales
20	Market
30	Product

either should match or null.

Enterprise Constraints :- These are the additional rules which are given by the user & DBA of a a database. eg <, >.

Passion
Page No.
Date

Codd's Rule:- Founder of RDBMS is Dr. E.F Codd
There are 12 rule are as following:-

(1) Information rule:- All information represented in form of tables
(2) Guaranteed Access rule:- To Access any info we use key.
(3) Comprehensive data Sublanguage rule:- There should be a particular language to support RDBMS rule.
(4) View updating rules:- If we change any data in Database then it should be automatically updated in all records or tables
(5) High level Insert, update & Delete:- The language we used it should contain these rule insert, update & Delete and perform all function.
(6) Physical data independency:- Change in lower level not effect higher lvel and this rule support.
(7) Logical Data idependency:- Change in conceptual level and doesnot effect external level.
(8) Integrity Independency:- RDBMS support all Integrity rule.
(9) Non Subversion rule:- Any language we use to access the database and, that language will support our Integrity independency.
(10) Systematic treatment of null value:- There should be special treatment of null value.
(11) Data Description rule:- Data we describe it should be in form of table

(12) Distribution Independence :- It should be platform independent

Data Manipulation :-
(1) Relational Algebra
(2) Relational calculus.

Q Difference b/w Relational Algebra & Relational Calculus.

	Relational Algebra	Relational Calculus.
(1)	It is procedural language In this we follow the procedure & step	(1) It is a non procedural language In this we automatically get output
(2)	We can combine 2 or more table to get an another table Both are non user friendly.	

Relation Algebra :- A (+) B

Relational operator :- Type of Relational operator
(1) Traditional Set Operator
(2) Special operator

(1) Traditional set operators :- → Union
→ Intersection
→ Difference
→ Cartesian Product

Union :- Combine two table

Employee

Emp-id	Name	Dept-id

Dep-id

Dep-id	Name

→ Intersection: Common element

→ Difference: The Difference between two set S1 & S2 produces a set, which contain all the member of one set, which are not in the other

R

Cust.name	Cust-Status
Ram	Good
Shyam	Excellent

S

Cust-name	Cust Status
Karan	Average
Ram	Good

(1) R ∪ S

Cust.name	Cust.Status
Ram	Good
Shyam	Excellent
Karan	Average

(2) R ∩ S

Cust.name	Cust.Status
Ram	Good

(3) R − S ⇒ Shyam.

(4) R × S = {(Ram, Karan) (R R), (S K), (S R)}

R

Name	Roll no
Ane	10
Mym	8

S

Name	Roll
Ajy	11
Arun	12

R × S = { Ane 10 ...

ii) Special operators: → Selection
→ Projection
→ Joins
→ Division

(1) Selection operation: It yields a horizontal subset of a given relation that is the subset of row should be selected with in the given relation for which a particular

Passion
Page No.
Date

Condition is satisfied. Sign of selection is (σ)

Employee :

Emp-id	Name	Salary

For row: $\sigma_{salary > 10,000}$ (Employee)

② Projection: The projection operation on a table, simply from another table by copying specified columns from the original table. Symbol of projection is (Π)

To select name of employee :

Π_{name} (Employee)

For salary :

Π_{salary} (Employee)

We want the name of all the employee having salary less than 70,000

Or say: $\sigma_{salary > 70000}$ [Π_{name} (Employee)]

Feb 11 12

Passion
Page No.
Date

Codd's Rules :-

(1) Information Rule :- All information in a relational database including tables names, column names is represented in the form of tables. This simple view of data speedsup design and learning process) user productivity is improved since knowledge of only one language is necessary to access all data such as description of the table and attribute definitions, integrity constraints [Action are taken when constraint are valiated. Access of data is restricted]

(2) Guaranteed Access Rule :- Every piece of data in relational database, can ibe accessed by using a primary key value that identifies the row name and column name. User productivity is improved since there is no need to resort to using physical pointers or address. It provide data independence or make it possible to retrive each piece of data in a relational database

(3) Comprehensive Data Sub-language Rule :- The RDBMS may support several languages. But atleast one of them should allow the user to do all following define table, view, query & update data, set integrity constraints, set authorizations & define transaction. User productivity is improved since there is just one approach that can be used for all database operations.

(4) View updating Rule :- Any view that can be updated theoretically can be updated using the RDBMS. Data Consistency is ensured since the changes made in the views are

transmitted to base table and vice-versa.

(5) High level Insert, update & Delete :- The RDBMS support insertion, updating and deletion at a table level. The performance is improved since the commands acts on a set of records rather than one record at a time.

(6) Physical Data independence :- → Application program is not affected by changes in the physical access or storage method. The Database administrators can make changes to the physical access and storage method, which improve performance and donot require changes in the application programs or request.

(7) Logical Data independence :- Logical changes in tables and views such as adding/deleting columns or changing field lengths need not necessitate modifications in the programs ~~or in~~.

(8) Integrity Independence :- Integrity Constraints (like table & view definition,) are stored in the one line catalog or data dictionary and can therefore be changed without (integrity independence.) necessitating changes in the application programs.

(9) Non Subversion Rule :- If the RDBMS has a language that accesses the information of records at a time, this language should not be used bypass the integrity constraints. This is necessary for data integrity.

(10) Systematic Treatment of Null values:- In RDBMS null values should be supported for the representation of missing ~~information~~ and inapplicable information. The database management must have a consistent method for representing null values.

(11) Database Description Rule:- The description of database is stored and maintained in the form of tables. It allows the user with appropriate authority to Query information in a similar way or language.

(12) Distribution Independence:- The RDBMS package must have distribution independence. Thus RDBMS packet must make it possible for the database to be distributed across multiple

Comparision:-

Relation Algebra	Relational Calculus
(1) It is a procedural method for solving Queries	(1) It is non-procedural method of Solving the Queries
(2) The Solution to the data base access problem using a relational algebra is obtained by stating what is required and what are the steps to obtain that information	The Solution to the database access problem using a relational Calculus is obtained simply by stating what is required and letting the system find the answer
It is used as vehicle for implementation of Relational Calculus	Relation Calculus Queries are converted into equivalent relational algebra format by using Codd's reduction Algorithm and then it is implemen

	with the help of relational algebra operators
(4) Relational algebra operators are used as a yardstick for measuring the expressive power of any given language.	A lang. is said to be Complete if it is at least powerful as the Calculus that is, if any relation definable by some expression of the Calculus is also definable by some expression of the language in question

Difference :

(1)
- Relational Algebra is a procedural language that can be used to tell the DBMS how to build a new relation from one or more relation in the database.
- Relational calculus is non-procedural language that can be used to formulate the definition of relation in terms of one or more database relation.

(2) Relation Algebra : user has to specify what is required and what are the procedure or steps to obtain output.

Relational Calculus : user just specifies what is required and need not to specify how to obtain it

	Strong Entity Set	Weak Entity Set
(1)	It has its own primary key	It does not have sufficient attribute to form a primary key on its own.
(2)	It is represented by rectang	It is represented by double rectangle.
(3)	It contain primary key represented by an Underline	It contain Partial key represented by dashed underline
(4)	The member of Strong entity set is called dominant entity set	The member of weak entity set is called Subordinate entity set
(5)	The relationship between two strong entity set is represented by diamond System	The relationship b/w one Strong and a weak entity set is represented by a double diamond sign. i.e Identifying relationship
(6)	The line connecting Strong entity set with the relationship is single	The line connecting weak entity set with identifying relationship is double
(7)	Total participation in the relationship may or may not exist	Total participation in the identifying relationship alway exist

Page No. Passion
Date

Relational Algebra :-

Joins :- General form
↳ Theta Join.

Theta Join :- It is a cartesian product operation on the two tables followed by a restriction operation on the resultant tables

eg :-

Employee Product

Name	Product
Raja	Pen
Spash	Pen
Raja	Pencil
Spash	Rubber

Product Customer

C-Product	Customer
Pen	Karan
Pen	Suneet
Pencil	Suneet

E = Raja Pen

Name	Product	Customer
Raja	Pen	Karan
	1	

Operation
↳ Comparision operator
→ equal =
→ Not equal to a
→ Greater than >

	Name	Product	C-Product	Customer
Equal =	Raja	Pen	Pen	Karan
	"	"	Pen	Suneet
Not equal →	"	"	Pencil	Suneet
	Spash	Pen	Pen	Karn
	"	Pen	Pen	Suneet
	"	"	Pencil	Suneet

Page No.
Date

Equi Joins :

Natural Joins : The projection operation which does eliminate one of the duplicated column resulting from the equi join, the natural join is obtained.

Name	Product	Customer
Raja	Pen	Karan
"	"	Suneet

→ Inner Joins :

→ **Outer Joins :** If it requires stack the value exist in only one table must appear in the output then the solution is outer joins.

Name ~~Product~~

These are of two type

1) Left outer joins
2) Right outer joins

Relational Calculus :

Difference b/w Algebra and Relational Calculus

Relational Calculus
- → Tuple
- → Domain

Page No
Date

Normalisation :-

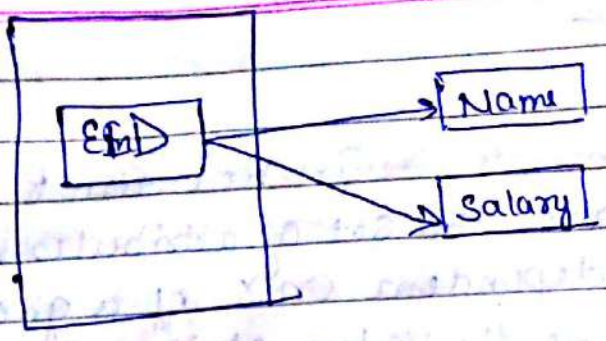
1) Fuctional Dependency :- In Relation R, X & Y are the two subset are the set of attributes, Y is said to be function dependent on X if a given value of X uniquely determine the value of Y
It is denoted by $X \rightarrow Y$ to
Y is called Determined
where X is
Called determinant

Employee

EID	Name	Salary
1	XYZ	30,000
2	Abc	20,000
3	Pqr	10,000

$X_{(EID)} \rightarrow Y_{(Name, Salary)}$

Functional Dependency chart :- It is the graphical representation of functional dependencies among the attributes in any relation
Steps :-
1. find out the primary key attribute
2. Make a rectangle write all the primary key attributes inside it
3. write all the non primary key attribute outside the rectangle
4. use the arrows to show the functional dependencies among the attributes



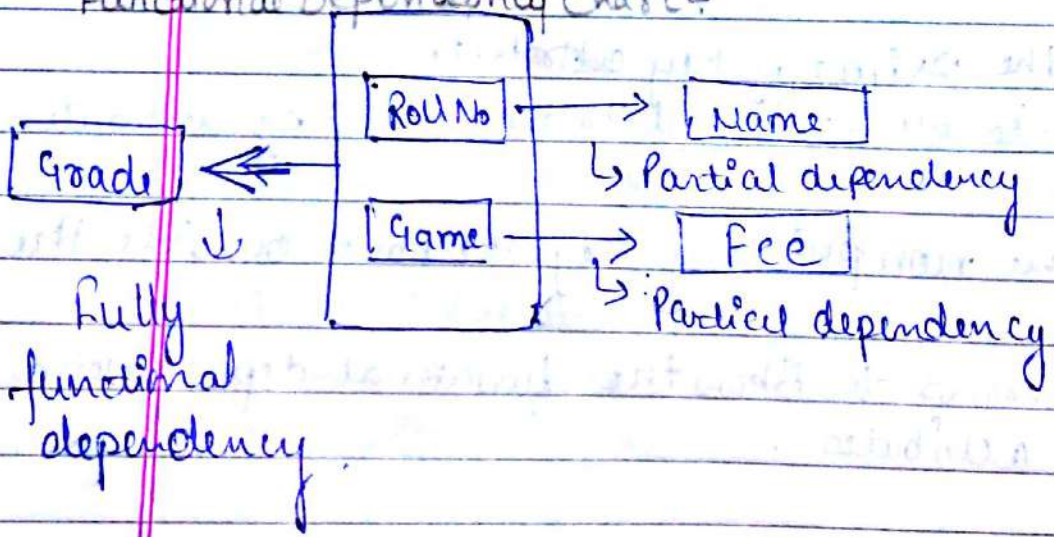
→ Types of functional Dependency :-

① Partial, Fully Dependency

- Partial Dependency :- Suppose we have more than one attribute in primary key. Let A be the non primary key attribute. If A is not dependent upon all the primary key attribute than partial dependency exists.

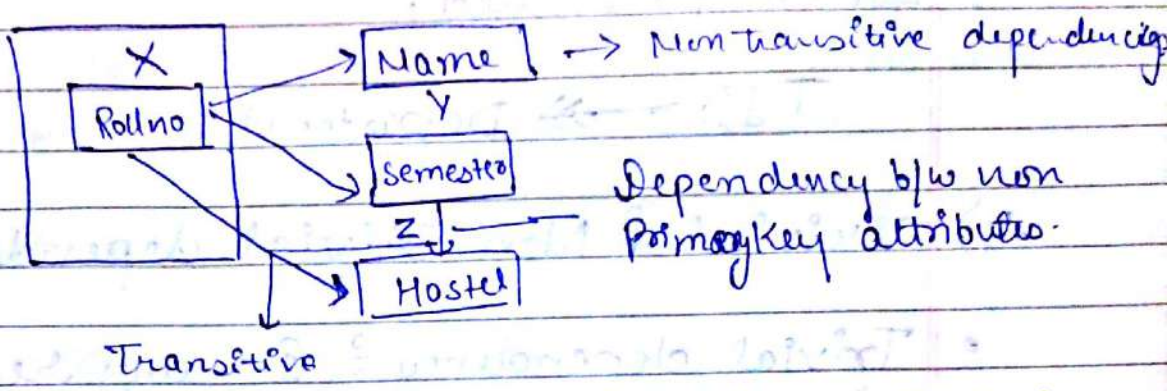
- Fully functional Dependency :- Let A be the non primary key attribute & value of A is dependent upon all the primary key attributes then A is said to be fully functional dependency.

Functional Dependency Chart :-



(2) Transitive & Non-Transitive dependency :-

- Transitive dependency is due to dependency between the ~~Known~~ non-primary key attributes.
Suppose in a relation R, $X \to Y$, $Y \to Z$ then $X \to Z$



- Non Transitive :- Any functional dependency which is not transitive is known as Non Transitive dependency.

NOTE :- Non transitive dependency exist if there is no dependency b/w the ~~Known~~ non primary key attributes

(3) Single valued & multiple valued dependency :-

- Single valued :- In any relation R, if for a particular value of X, Y has single value then it is known as single valued dependency.

Teacher ID	Name	Department
1	Abc	CSE
1	Abc	MG
2	Xyz	Civil
2	Xyz	ECE
3	Pqr	ECE
3	Pqr	CSE

→ for single value

TeacherID → T Name

→ for multiple valued :

TID →→ Department

4) Trivial & Non Trivial dependency :-

- Trivial dependency :- In any relation R, $X \to Y$ is trivial if $Y \subseteq X$
- Non Trivial depency :- In any relation R, $X \to Y$ if $Y \not\subseteq X$

Anomalies :- undesired result

→ Insertion
→ Deletion
→ Update.

EID	Name	Salary	DeptNO	Department
4	Pq r	39,000	34	Marketing
5	ABC	20,000	3	Marketing

→ **Normalization**: It is a process by which we can decompose or divide any relation into more than one relation to remove the anomalies in the relational database

Normal forms: It is a step by step process and each ~~pro~~ step is known as Normal form

→ Properties of Normalisation :

(1) Remove different anamolies
(2) Decomposition must be ~~for~~ lossless
(3) Preserves the necessary dependency
(4) Reduce Redundancy

In Normalisation there are 5 Normal form

(1) First Normal form :
- ↳ Composite attributes
- ↳ Flattening the table
- ↳ Decomposition of table

Teached ID	Name	Subject
1	XYZ	ADA DBMS C, C++
2	PQR	Java, Automata ADCP

(1) Composite attribute

Teacher ID	First Name	Last Name	Subject

(2) Flattering the table

Teacher ID	Name	Subject
1	XYZ	DBA
1	XYZ	DBMS
1	XYZ	C
1	XYZ	C++
2	Pqr	Java
2	Pqr	Automata
2	Pqr	ADCP

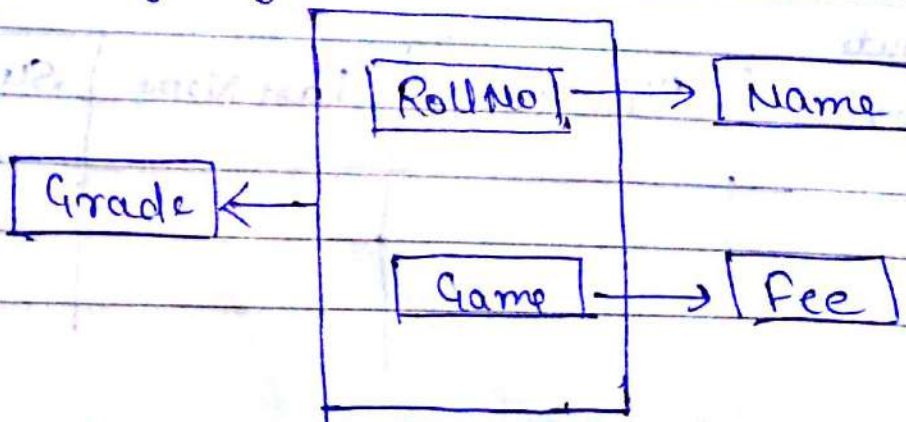
(3) Decomposition of table :

Teacher ID	Name

Teacher ID	Subject

A relation is in the first normal form if the domain of each attribute contains only atomic values it means atomicity must be present in the relation

(4) Second Normal form : A relation is in the second normal form if it is in the first normal from and all the non primary key attribute must be fully functionally dependent upon the primary key attribute



Roll No	Name	Game	Fee	Grade

Partial dependency:

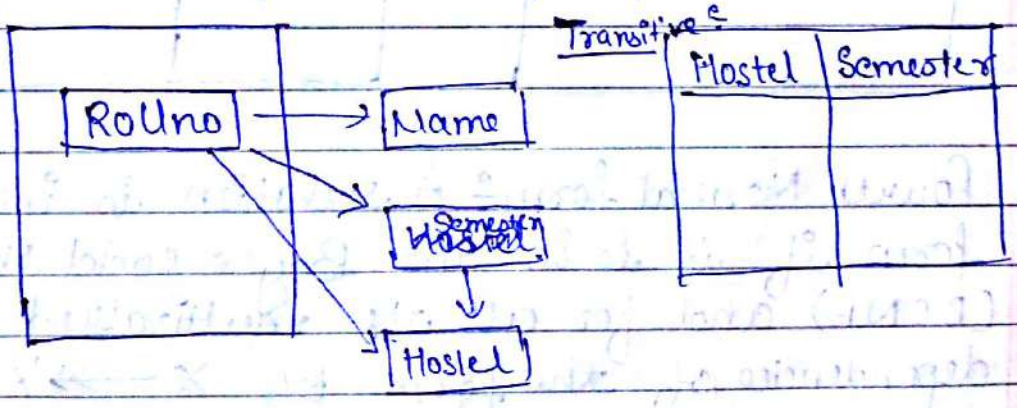
Roll no	Name

Game	Fee

Full dependency:

Roll No	Game	Grade

III) Third Normal form: A relation is in the third normal form if it is in the second normal form and Non primary key attributes must be non transtively dependent upon primary key attributes.



Non transitive:

Roll no	Name	Semester

BCNF (Boyce Codd Normal form) :-
A relation is in BCNF if and only if all the determinants are the Candidate Key

$X \rightarrow Y$ → determined
↓
determinant

Roll no.	Teacher	Subject

↳ Roll no.
→ (Roll no, Teacher ID)
↳ (Roll no, Subject)

Roll no	Teacher ID

Teacher ID	Subject

IV:- Fourth Normal form :- A relation is in fourth form if it is in the Boyce Codd Normal form (BCNF) and for all the multivalued functional dependencies of the form by $X \twoheadrightarrow Y$

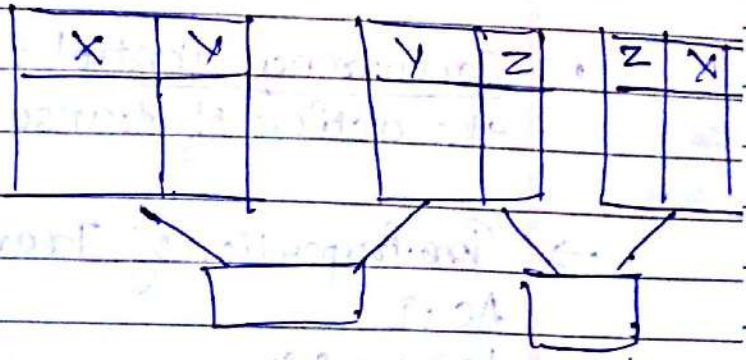
Programmer	Project	Module

Programmer	Project

Project	Module

V Fifth Normal form (Join dependency):-
Let R be a given relation upto fourth Normal form or (4NF). and it decompose into (R_1, R_2, R_3 --- R_n) The Relation R satisfy the join dependencies if and only if joining R_1 to R_n = R

X	Y	Z
X_1	Y_1	Z_1
X_2	Y_2	Z_2
X_3	Y_3	Z_3



Transaction & concurrency Control

- **Transaction:** It can be defined as a unit or any part of any program at the time of its execution. During transaction the data items can be read or updated or both

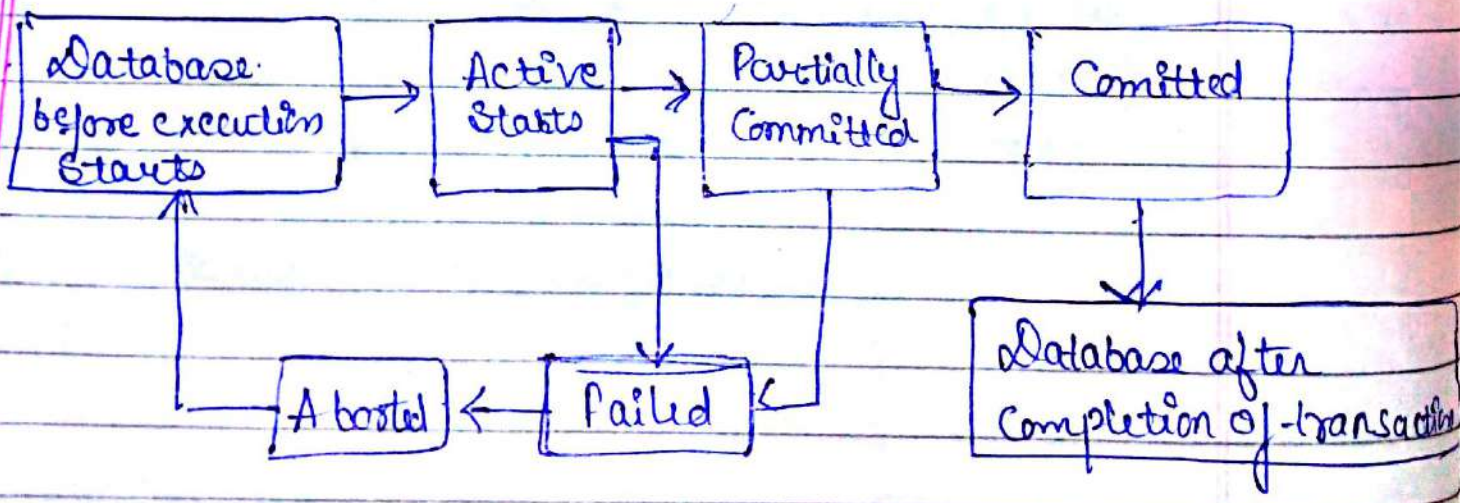
- **Concurrency Control :** It is the activity of co-ordinating the action of transactions, that operate simuntaneously

→ Transaction Properties of Transactions.

ACID
- ↳ Atomicity
- ↳ Consistency
- ↳ Isolation
- ↳ Durability.

- **Durability:** Changes are made permanent to the database after successfull completion of the transaction

→ **Transaction States:**



- Serializability: Considered the set of transactions $T_1, T_2, T_3 \dots T_i$. S_1 is the state of database after they are concurrently executed and successfully completed and S_2 is the state of database after they are executed in any serial manner and successfully completed. If S_1 and S_2 are same then the database maintain the serializability.

- Concurrent Execution: If more than one transaction are executed at the same time then they are said to be executed concurrently

- Recoverability: To maintain the Atomicity of the database, undo effects of any transaction has to be performed in case of failure of that transaction. If undo effects are successfuls then that database maintains the recoverability. This process is also known as role back.

→ Conduct an ER diagram for Banking System

Construct an ER diagram for Hospital Management System

Hospital management :-