TRADITIONAL FILE SYSTEM

A manual file System was used to maintain the records and the files. Data was stored and processed using a traditional file system which makes it easy to find information.

- In ~~A~~ file processing system (FPS), each file is dependent on each other and they can only be integrated by writing individual program for each application.
- The data and app program that uses data are arranged and any changes to data sometimes require modification of application program.
- Sometimes it is not possible to identify all the programs using data; all functional areas in the organisation itself creates and processes its own files

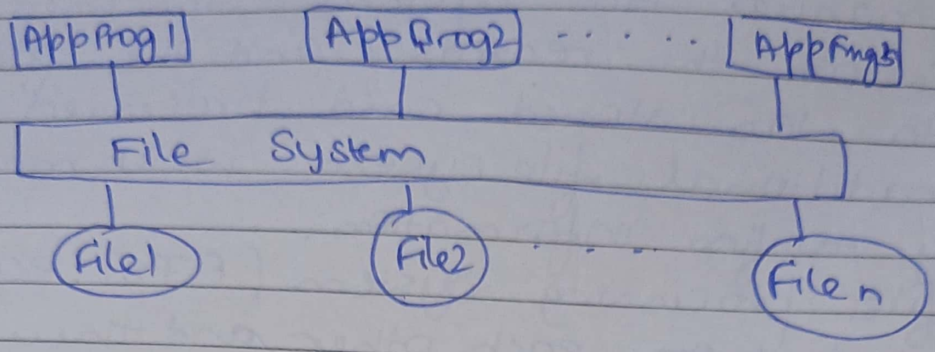
Features of traditional file System

- It stores data in group of files.
- Files are dependent on each other.
- It is difficult to maintain traditional FS.
- TFS is also called Flat FS.

FUNCTIONS

- Stores and arrange comp files
- Stores files in database, manipulated and retrieved by computer OS.
- It performs services for end users.
- Inserting, deleting, updating and adding new files to existing DB.

- Each program defines and manages its own data



DISADVANTAGE

- Data Redundancy (duplicate data)
  Each app has its own data, same data may have to be recorded or stored many times

- Data inconsistency
  Due to the same data items that appear more than once and donot get updated simultaneously in each and every file

- Data Dependency
  Program in app in FPS are data dependent because of incompatibility with various file formats.

- Limited data Sharing
- Security
- Retrieval is not easy.
- Time Consuming.
- Requires labour
- Inefficient to maintain the record of a big org having large amt of data items.

collection of proguses for managing data

Undo - old value
Redo - newvalue

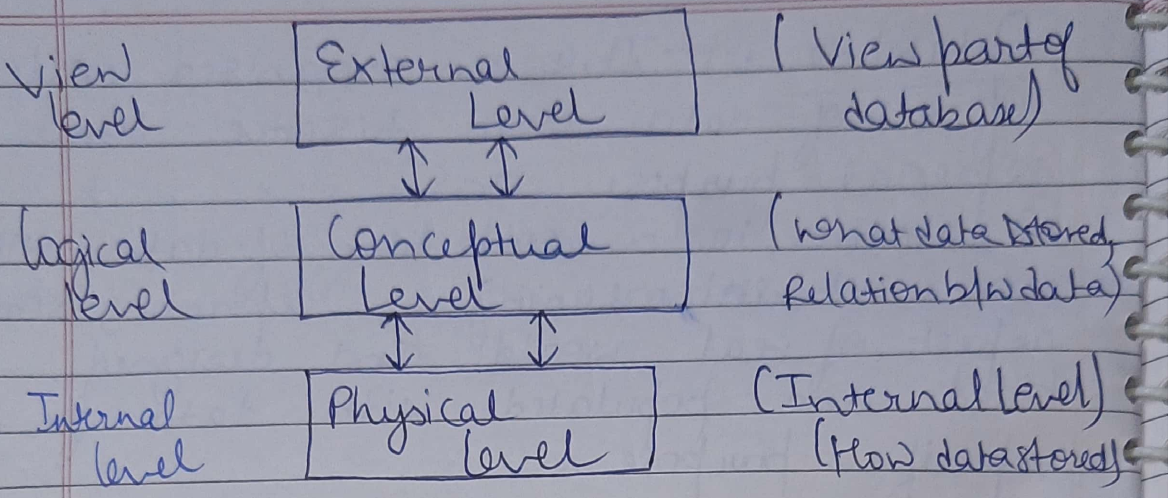
Database — It is an organised collection of set of data used to serve some special purpose or
A database is a collection of data with some inherent meaning, represting some aspect of real world and designed, billed and populated with data for a specific purpose.

DBMS
It is a collection of app programs that enables a user to create and maintain a database. OR It is a general purpose software system that provides the user with the processes of defining, ~~dat~~ constructing, and manipulating the database for various applications.

Advantages
1) Data is stored in a structured way
2) Redundancy is controlled.
3) It consumes less space.
4) Unauthorized access is denied.
5) It provides multiple user interface.
6) Providing data backup and recovery (Undo & Redo)
7) Data Security and integrity
8) Concurrency Control.
9) Data independence.

imp Levels of Data Abstraction / Three schema arch.

Single data = datum



→ Physical Level

1) Lowest level of Abstraction which describes how data are stored

2) Physical level also called internal level

→ Logical Level

1) This is the next higher level of abstraction describes what data are stored and what relationship holds b/w data.

2) The logical level is also as conceptual level.

→ External Level

1) This is the highest level of abstractions describes only a part of entire database.

2) External level is also called as view Level.

Advantage of DBMS.

1) Data Independence

The ability to modify schema defination at one level without affecting a schema definition in next higher level is called data independence.

2 types of data independence:

- Physical data independence - ability to change schema in physical level without affecting the change in conceptual and External Level.

- Logical data independence - the ability to change schema in logical level without affecting the change in external level.

→ 2) Schemas and Instance

The overall design of ~~for~~ database is called schema and schema include schema objects like table, Primary Key, foreign Key, columns, datatypes, etc.

Instance

The data stored in database at a particular moment of time is called an instance of database.

✓

Types of database users:

- Application Programmers: they develop application program and these programs can manipulate the database in all possible ways

- End users: the end users access the database from a terminal using a query language provided by the database system or through the application programs developed by app programmers.

imp Database Administer (DBA) Is the person who is responsible for design, construction and maintainance and the refrain the illegal access into the database

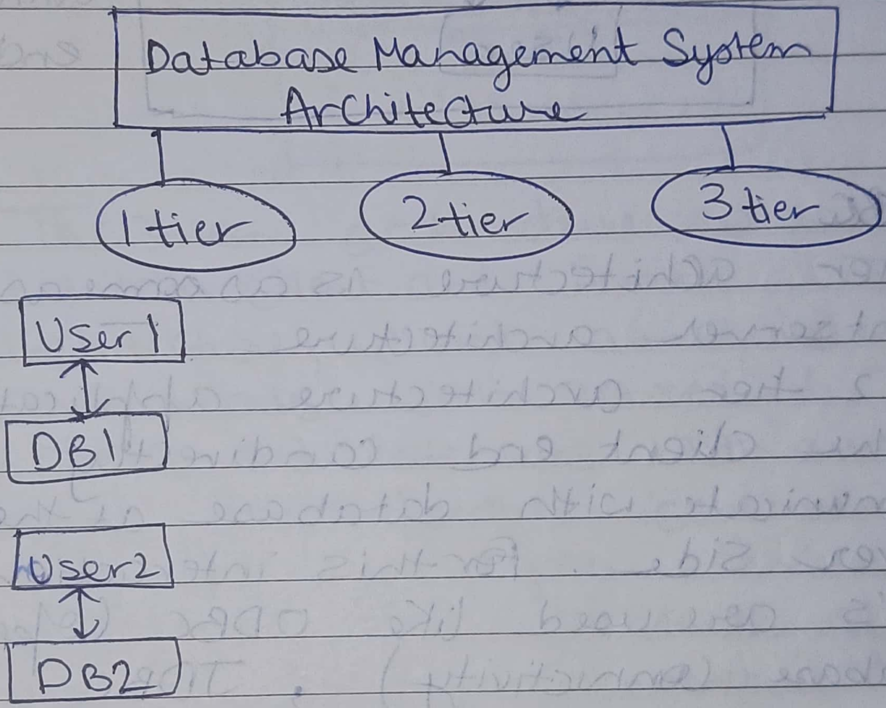
Naive users: which hardly knows anything about database

→ **Database Architecture:**

DBMS depends upon its achitecture which is basically a client server architecture used to deal with the large number of personal computers, web servers, database servers and other components that are connected with the network.

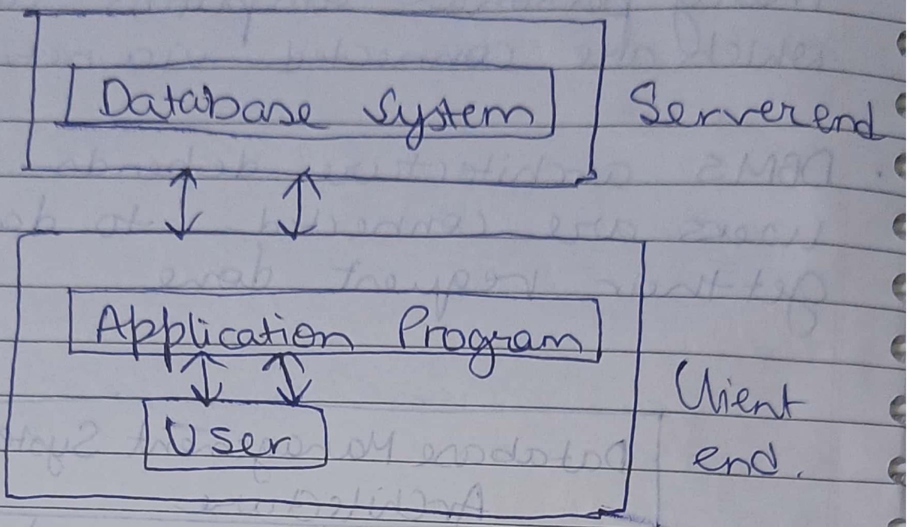
- The Client - server architecture consist of many personal computers and workstations which are connected via network.

- DBMS architecture depends upon how users are connected to database to get their request done.



1 tier : in this architecture, database is directly available to user. It means user can directly sit on DBMS and use it Any changes done here will directly be done on database itself. It does not provide handy tools for end users. 1tier architecture is used for development of local applications, where programmers can directly communicate with the database for quick responese.

2 tier architecture

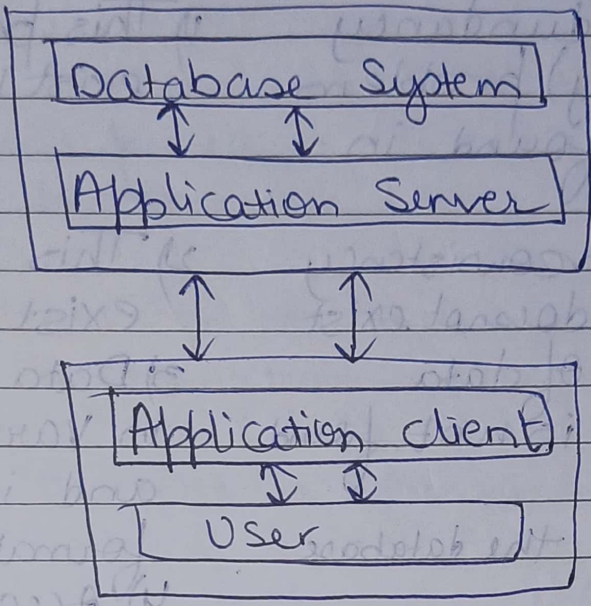


- 2 tier architecture is as same as Client server architecture
- In 2 tier architecture applications on the client end can directly communicate with database at the server side. For this interaction, API's are used like ODBC (Open database connectivity), JDBC (Java DatasBase Connectivity)
- The user interface and app programs are done on Client side
- The server side is responsible to provide functionality like query processing and transaction management
- To communicate with the DBMS, Client side application establishes a connection with server side.

used in web applications.

~~up~~

3 tier



- The 3 tier architecture contains a layer between Client and Server. In this architecture, client cannot directly communicate with server. The application on client end interacts with an application server which further communicates with database system. End user has no idea about the existence of database beyond application server. The database also has no idea about any other user beyond the application.
- It is used in large web applications.

3Oct

DBMS	File Processing System
1) Data Redundancy (duplicacy) problem is not found in DBMS.	1) This problem exist here.
2) Data inconsistency problem doesnot exist	2) This problem exist here.
3) Problem of data isolation is not found here.	3) Data are scatterd in various files and in different formats.
4) Accessing the database is easier	4) Accessing database in files is comparitevly difficult
5) (Indivisible) Atomicity and integrety problem are not found here.	5) Both problem are found here.
6) Data is Secured in DBMS	6) Data not secured in FPS.
7) Concurrent access and crash recovery procedures are found indBMS.	7) No concurrent access and crash recovery proc. in FPS.

Data Integrity

Refers to ensuring that the data in database is acurate. Since in DBMS data is centralized and is used by no. of users at ~~a time~~ same time. So it is essential to eforce integrity constraints

Applications of DBMS.

1) Banking : for maintaing customer information, accounts information, notes info and banking transaction.

2) Universities : for maintaining student record, course registeration and results.

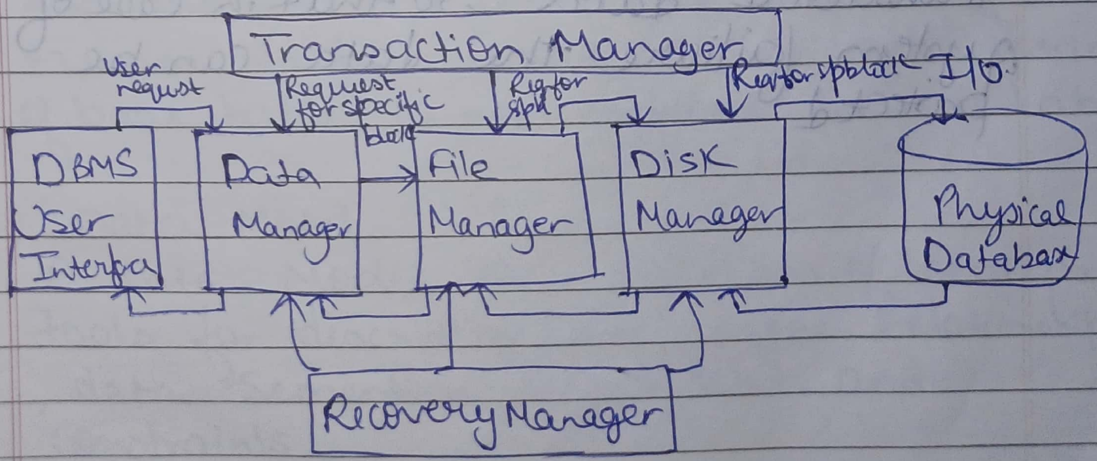
3) Railway Reservation : for checking availability of different trains, tickets.

4) Airlines : for reservation & schedule info.

5) Telecommunication : for keeping records of calls, generating monthly bills, etc.

6) Sales : for customer, product and purchase information.

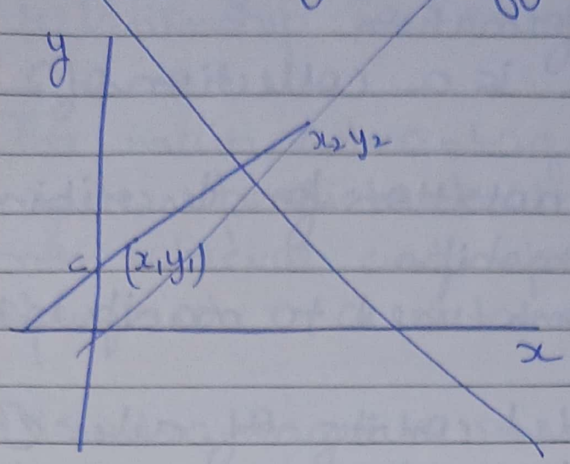
* COMPONENTS OF DBMS.



- The user request for a Specific informatio withthe help of user interface i.e application programs
- This requst is processed by Data Manager and after processing, data Manager ~~rq~~ request for specific records to file manager
- The file manager then request for the specific block to disk manager
- The disk manager retrives the record from physical database and then Sends the data to disk manager and disk manger Sends the data to file manager and file manager Sends back the data to to data manager and the response of query is again Sent to the requested user
- The transaction manager Supervises (control) the data transaction i.e Carried out between data manager and disk manager
- The recovery manager Keeps a check on transacted data So that in case of system failiure the data can be protected

6 Oct

DDA Digital Differential Analogy



Terms related to database

i) Extension

It is the number of tuples present in table at any instance. It is time dependent

ii) Intension

It is a constant value that gives the name, structure of table and constrainst ~~keys~~ laid on it

iii) View Table

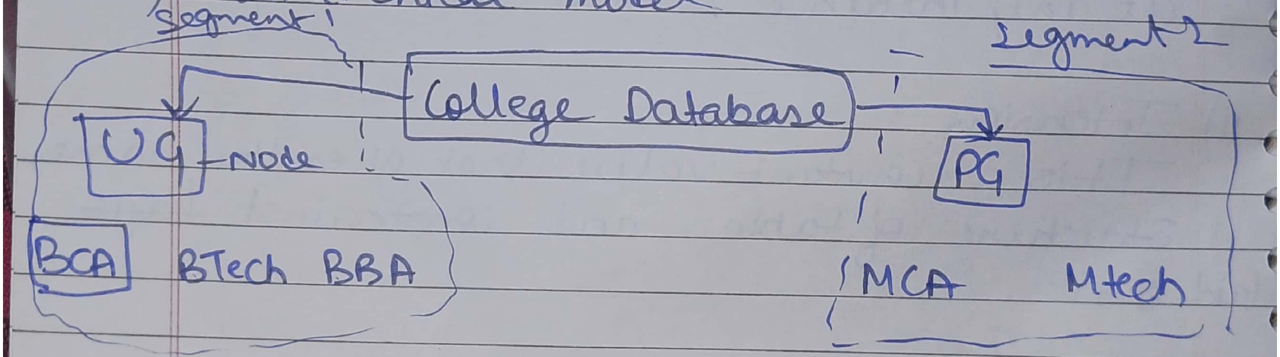
A table that doesnot really exist ~~in its own derivation~~ and it can be derived from one or base table. Growth and restructuring of base table is not reflected in view table

iv) Data Model. imp.

A data Model is a collection of conceptual tools for describing data, data relationships, data Sementics (sense of data) and constraints.

imp

Data Modelling is a way of organising a collection of information
A Database model is a collection of 2 parts
a) A mathematical notation for describing data and relationships
b) A set of operations used to manipulate that data.
A database model consists of rules & standards that define how data is organised in a database.
There are 4 basic types of data models in a database
i) Hierarchical model



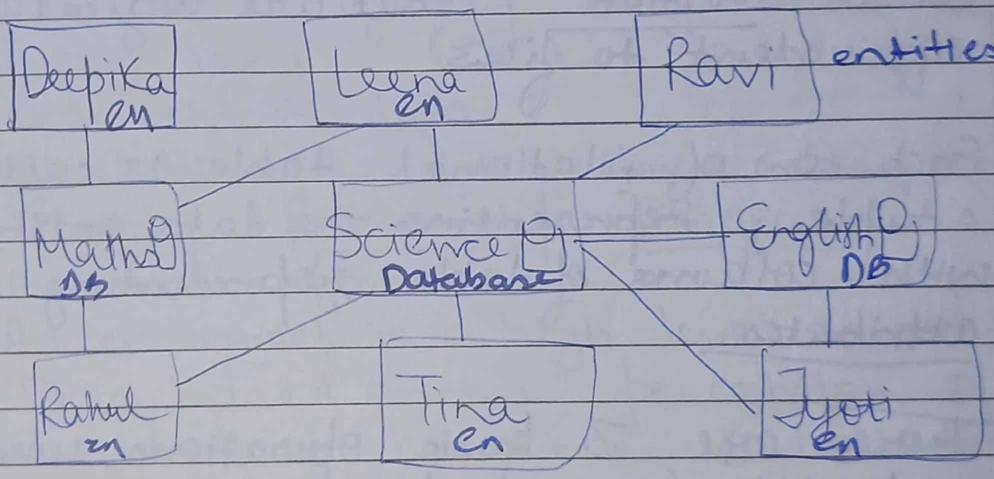
- It is the oldest form of database
- This data model organises data in a ~~thrott~~ treestructure i.e. each child node can have only one parent node. In this model, a database record is a tree that consist of one or more groupings of fields called segments which make up the individual nodes of the tree

The hierarchical model uses parent child relationship i.e one to many relationship.

The main advantage is that data access is quite predictable in structure and therefo both retrieval and update can be highly optimized in a database.

Disadvantage is one to many relationship i.e it restricts a child node to have only one parent.

ii) Network MODEL



The network model expand on hierarchical model by providing multiple paths among Segments that is more than one parent child relationship exist.

This model allows 1:1 , 1:M, M:1 , M:M relationships
The basic data modelling constructs in the network model is Set Construct.

Table → Relation
Row → Tuple
Column → attribute

A set consists of set name, records and its types.

A network database stores information in datasets which is similar to files and tables

iii) Relational Model

Name	id	Add

A relational DB represents data in a database as a 2 dimension table called relation that are logically equivalent to files

Each row of relational table is called a tuple, representing the data entity with columns of table representing attributes.

There are 3 basic operations used to develop sets of data

i) Selection (whole row)
ii) Projection (particular field)
iii) Joins (merge table)

Together with these 3 operations, relational database is called Relational Algebra

- It provides flexibility that allows us to change the structure of database.

iV) OBJECT ORIENTED DATABASE MODEL

- An object oriented database stores & maintain objects
- An object is an item that can contain both data and procedure that manipulates the data.
- As compared to relational Database, object oriented DB model can store more types of data and access much faster.
- It uses a query lang called object query lang (OQL) to manipulate and retrieve data.

Highlevel datamodel, define data elements & relationship 13 oct

Entity Relationship Diagram

describe structure of Database

An er model is a high level data model.
It is based on the perception of real world that consist of collection of basic objects called entities and of relationships among these entities.

ER model represent the overall logical structure of a database.

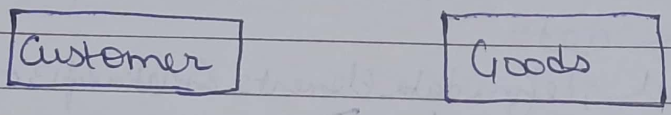
Three Schema Architecture
- logica
physica
externa

Entity

- An entity is an Object that has its existence in real world.
- It includes all those things about which data is collected. An entity maybe a tangible object (we can change those things) such as student, place.

It may also be a non tangile objects such as job title, event or a Customer account.

- For examples: customer buys goods
- Diagramatically, entities are reprented in rectangles

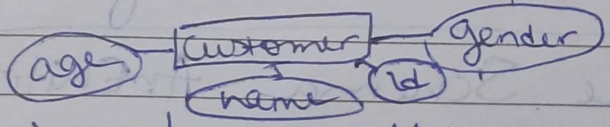


Attributes

- Attributes are units that describe the characteristics or properties of entities

In a DB, enties are represented by table and attributes by column name

Attributes are drawn in elliptical shape



Domain

The Domain of an attribute is the collection of all the possibble values an attribute can have.

Field / Column

A column represents one related part of a table and is the smallest logical structure of storage in a database.
It holds one piece of information about data

Record / Row

A record is a collection of multiple related fields that can be treated as a unit.
Each row is a record.

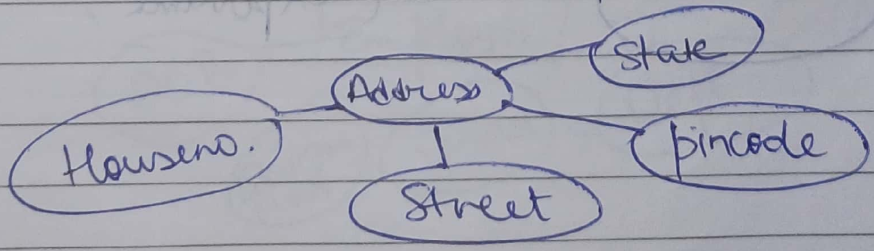
Table

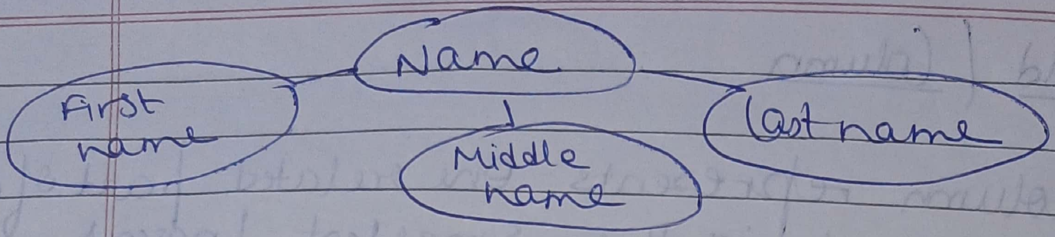
A table is a named collection of logically related multiple records

Types of Attributes

Simple attributes are those attributes which cannot be divided into subparts.

Composing attributes are those attributes which can be divided into subparts





Single value Attribute.

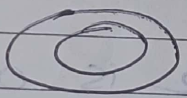
Attribute which has a single value for a particular entity is called single value attribute.

ex- account number.

Multivalued Attribute

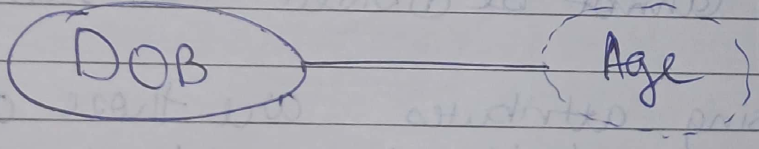
Attributes which have more than 1 value for a specific entity is called Multivalue attributes.

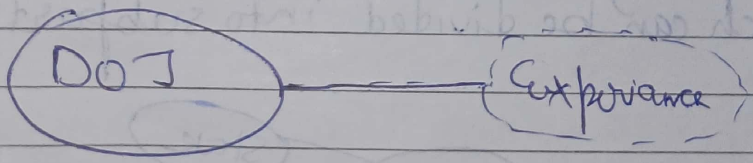
Multi valued attributes are represented by double oval.



Phone no, landline

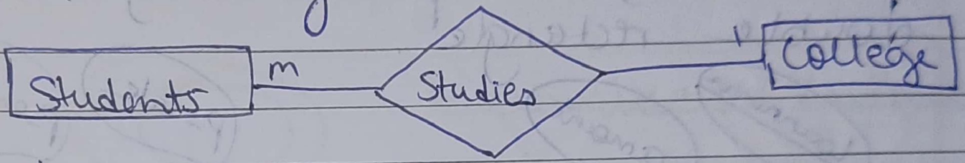
Derived Attributes are represented by dotted oval. The value for this type of attribute can be derived from the value of other related attribute





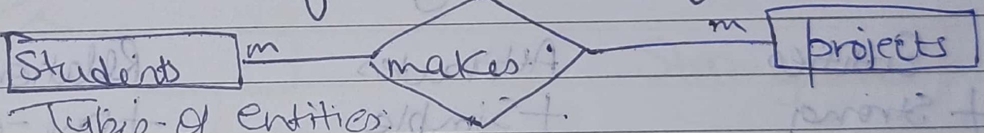
Many to one

When more than one instance of an entity is associated with a singe instance of another entity



Many to many

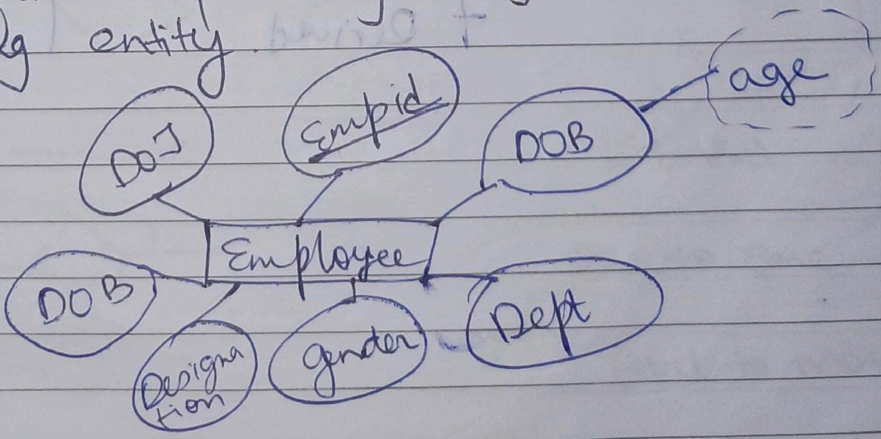
When more than one instance of entity is associated with more than one instance of another entity.



Types of entities.

Strong Entity

An entity that possess sufficient attributes to form a primary Key is called a strong entity.

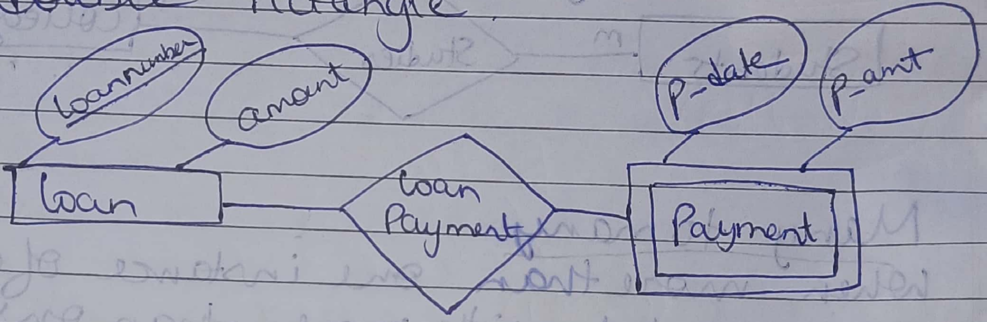


Underlind attributes are primary Key attributes

Weak Entity

An entity set that doesnot possess Sufficient attributes to form a primary Key is called a weak entity Set.

Weak entity is represented by double rectangle.



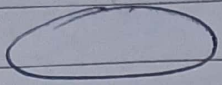
ER Diagram

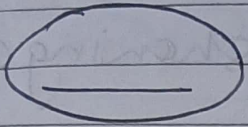
Entities
- Strong
- Weak

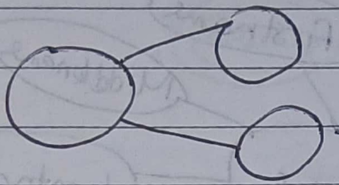
Attributes
- Simple
- Composite
- Single-valued
- Multi-valued
- Derived

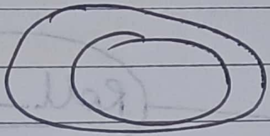
Relationships
- One-one
- One-Many
- Many-one
- Many-Many

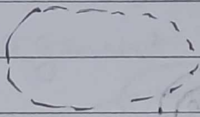
Notations of ER Diagram.

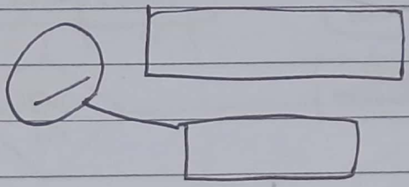

Attribute


Primary Key

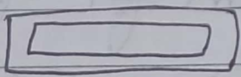

Composite Attribute.

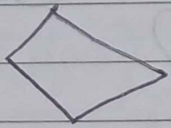

Multivalued Attribute.

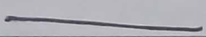

Derived Attribute

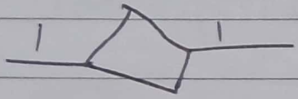

Entity

Strong Entity

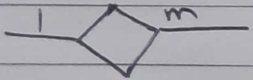

Weak Entity.


Relationship

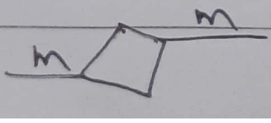

links



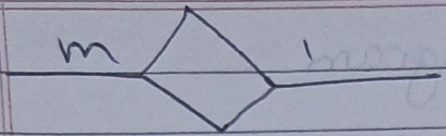
One to One



One to many

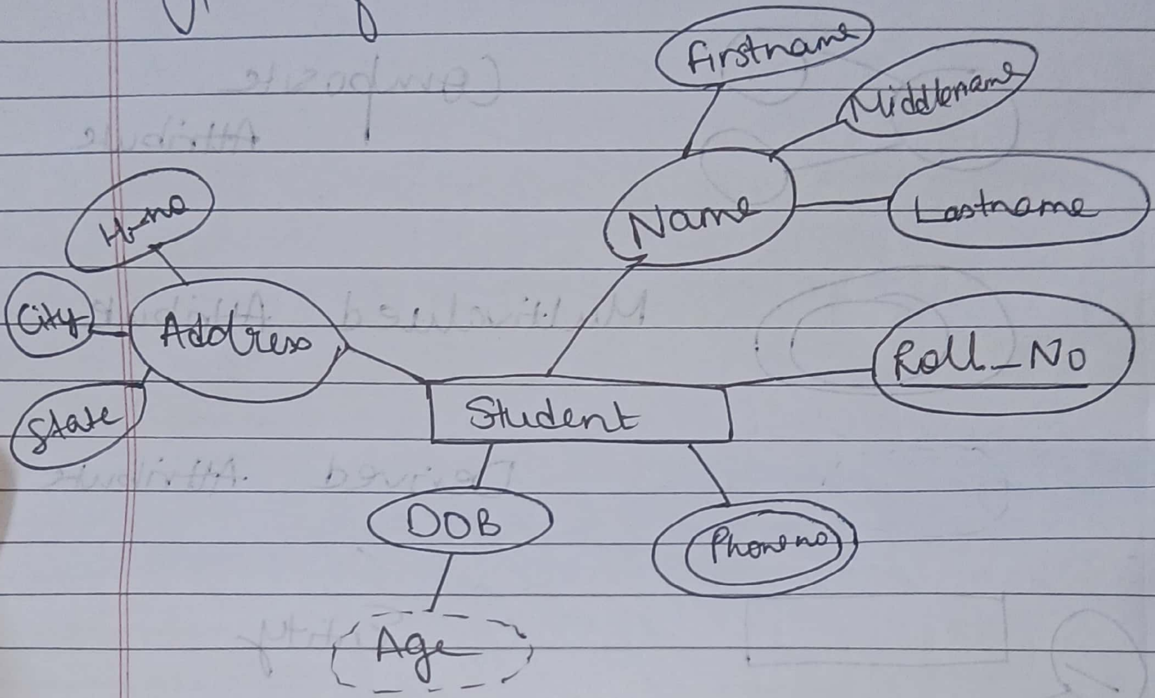


many to many

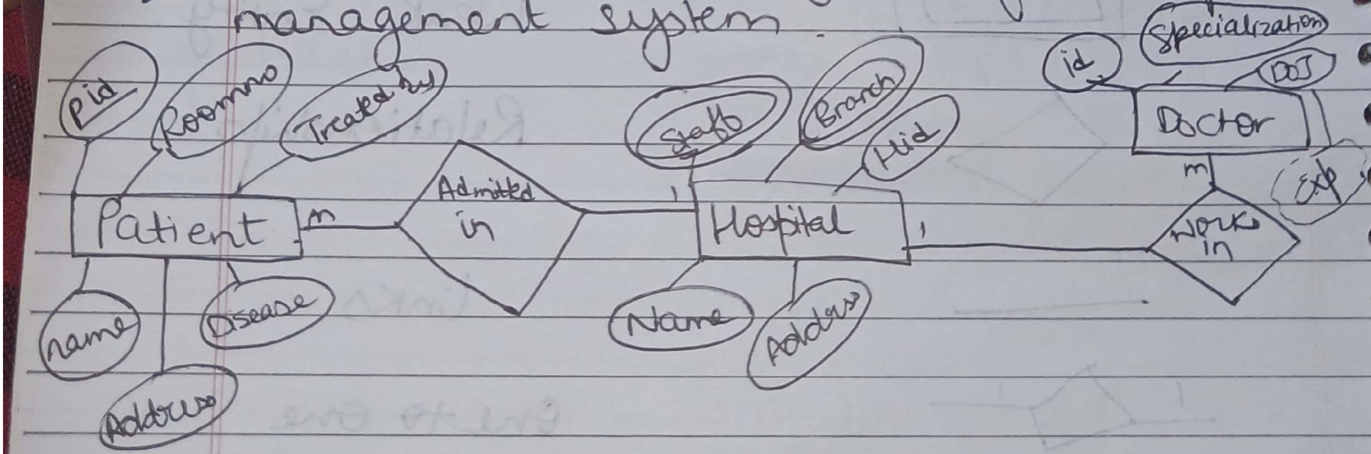


many to one

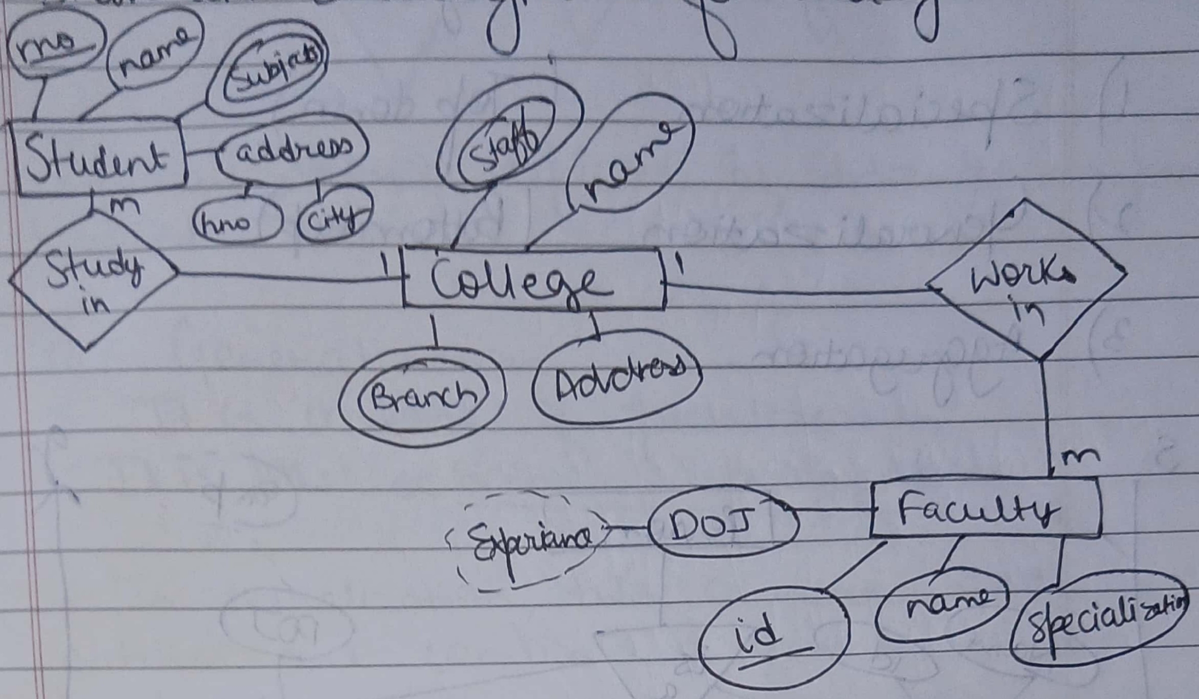
Q Draw an ER Diagram showing all types of attributes.



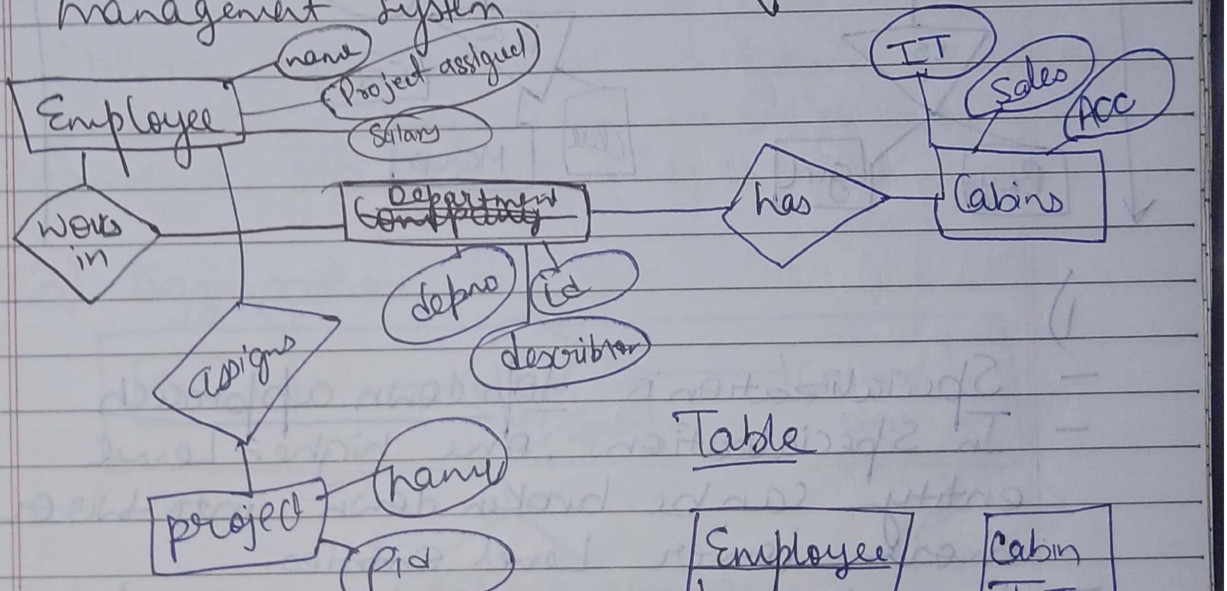
Q Draw an ER Diagram for Hospital management system.



1Q Draw an ER diagram for college.



Q. Draw an ER Diagram for employee management system



Table

Employee
name
id
Projectass
Salary

Cabin
IT
Sales
acc

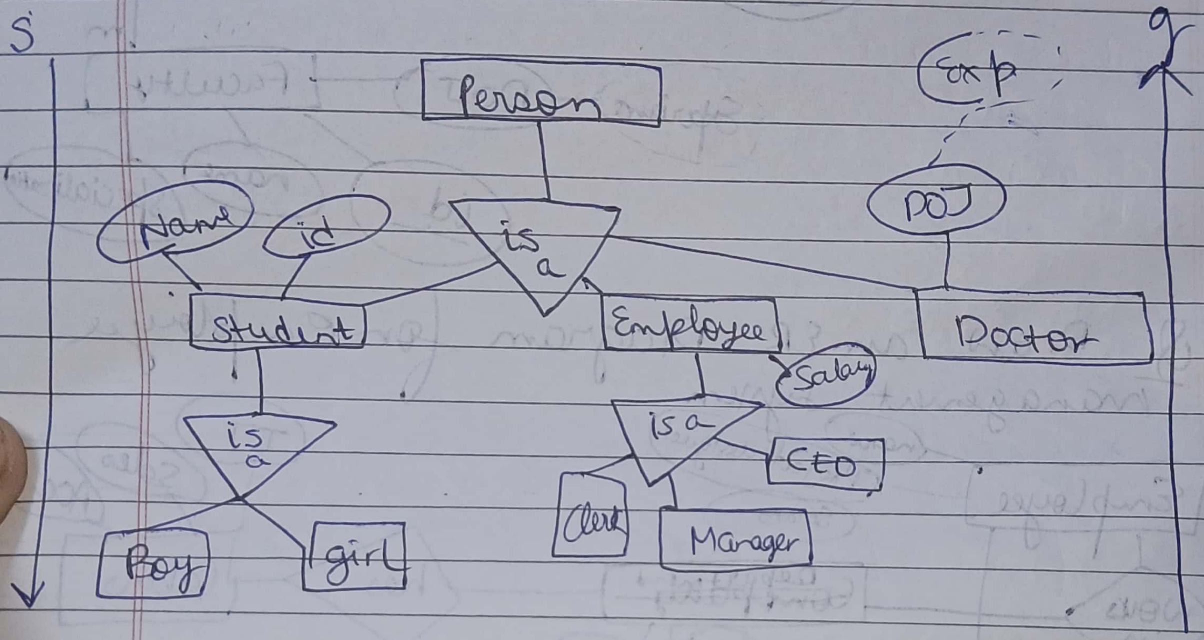
Table for Multivalue.

Extended ER Diagram

1) Specialization (Top down)

2) Generalization (Bottom up)

3) Aggregation.



1)

- Specialization is top down approach
- In Specialization, one higher Level entity can be broken down into two or more lower Level entities.
- Specialization is used to identify the subset of an entity set that shares ~~[illegible]~~ some different characteristics
- Normally, a superclass is defined first and its related attributes are defined, its subclasses are defined next and their related attributes. and at last relationship is added.

The label is a , ISA stant for is a.

Specialization is depicted by triangle component Labelled ISA.

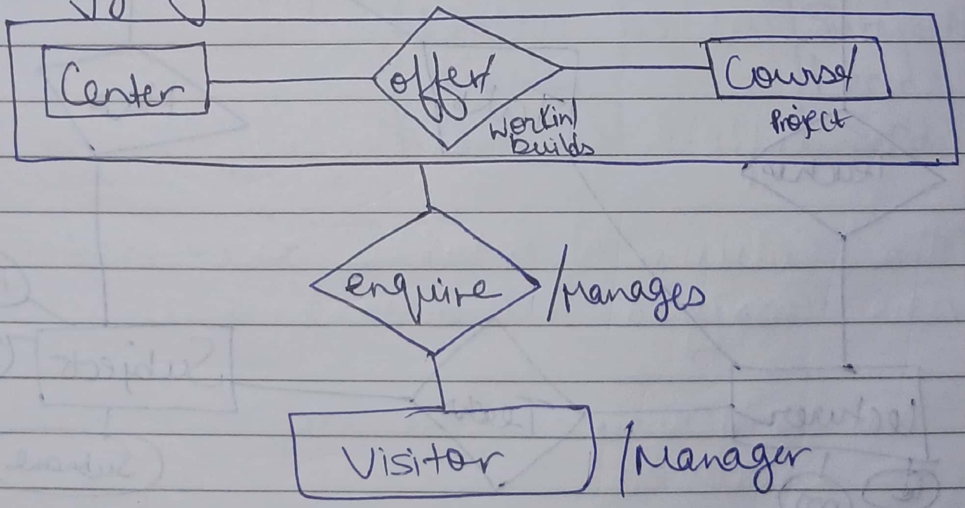
2) Generalization

- It is inverse of specialization
- It is like a bottom up approach

- In generalization, two or more Lower level entities are combined to form one higher level entity if they have some attributes in common.

- Entities are combined to form a more generalized entity i.e. subclasses are combined to form a superclass.

3) Aggregation.



process in which entities are combined to form a single meaningfull entity. Specific entities are combined b'coz they donot make sense individually To establish single entity, agg creates a relationship

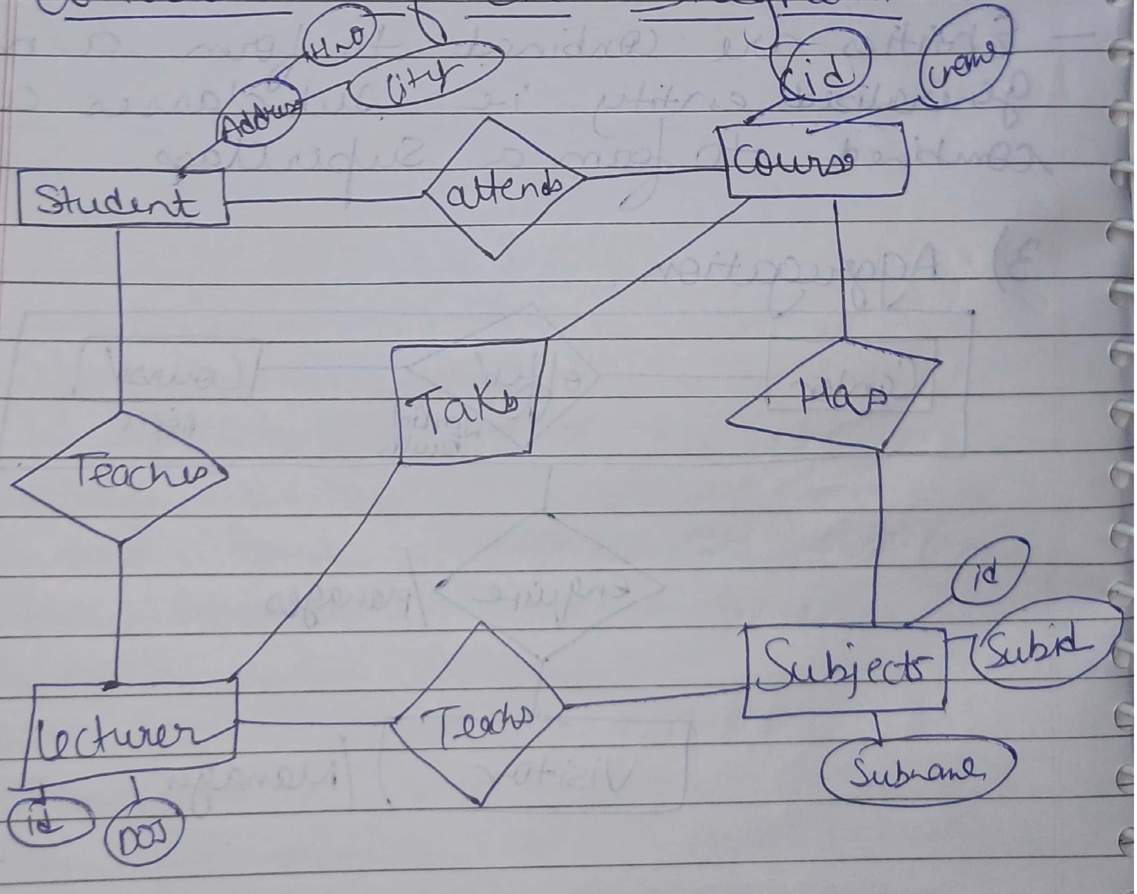
In aggregation, the relation b/w 2 entities

In aggregation, relationships with its corresponding entities is aggregated to a higher level entity

For ex-

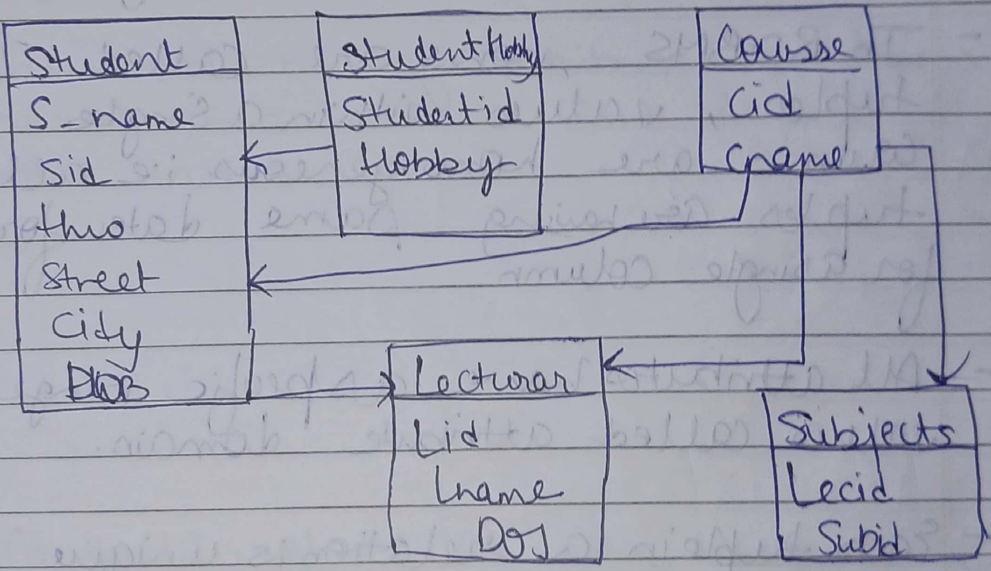
Center entity offers the course entity that acts as a single entity in the relationship which is in a relationship with another entity

Conversion of ER Diagram



Howto convert an ER diagram totable

- Entity become a table nane.
- All Single value attributes becomes a column for that table
- Primary Key attributes are listed in column name.
- The multivalued attribute is represented by a separate table.
- Composite attribute are listed column nane
- Derived attributes are not considered intable



Relational Model concepts.

A table is a logical construct in relational database management system (RDBMS)

- It is a 2D structure having rows and column
- Rows of a table represent the related records
- And colum represents attributes i.e row column intersection gives a single value data called field
- In RDBMS, rows are called tuples, values within a single column are homogeneous i.e all tuples are having same data format for a single column.
- All attributes have a specific range of values called attribute domain.
- Each tuple in a relation is unique
- The Column of a table or relation are assigned a distinct name
- The ordering of the tuples in relation in immaterial.
- likewise sequence of columns within a relation is of no importance

In RDBMS each table have a primary key

Row / Record · It contains the specific information of each entry in the table.
It is a horizontal entity in the table

- All tuples have same format.

Column / Attribute : · It is a vertical entity in the table.

- Contains all information associated with a specific field in a table.

Degree of a table.

The total no. of attributes or columns name in a table is the degree of entire table.

4. Cardinality of a table - the total no. of tuples at any one time in a relation (table) is the cardinality of entire relation

~~8~~0 Cardinality means empty table

→ Keys in RDBMS
The Integrity of the info Stored in a DBMS is controlled by keys.

- A Key is a attribute or a set of attributes which are used to uniquely identify every row or a record in a table
- A Key is normally corelated with one column in a table, although it might be associated with multiple columns.
- A Key is used to sort the data i.e, arranging the records either in ascending order or descending order
- Keys are also refered as sort Keys, index Key or Keywords.

- Types of Keys →

combination of columns that uniquely identifies any row within a RDBMS

1) Super Key - a super Key is a set of one or more attributes that collectively allow us to uniquely identify a tuple in a relation. It supports NULL value

id	Name	Marks	Dept	Course	
1	a	10	CS	C1	$K_1 = \{id\}$
2	b	7	EE	C_2	$K_2 = \{id, name\}$
3	a	8	CS	C3	$K_3 = \{id, name, dept\}$
4	b	7	EE	C2	$K_4 = \{id, name, dept, course\}$

Sort Key / Index Key / Keyword =

$SK_1 = \{id\}$

$SK_2 = \{id, name\}$

$SK_3 = \{id, name\ dept\}$

$SK_4 = \{id, name, dept, course\}$

2) Candidate Key
The minimal superkey is called as Candidat Key.
Each candidate Key must satisfy following 2 properties
i) Uniqueness
ii) Irreducable → cannot be decomposed or reduced

for ex- XY is a Super Key and X is also a superkey then XY can never be a candidate Key.

XY → S.K
X → SK
XY → X C.K

3) Primary Key - it denotes a Key i.e choosen by database designer as the principal means of identifying unique records within a relation.

The primary Key should be choosen in such a way that its value must not change.
ex- enrollment id can be designated as primary Key.

4) Composite Key.
It is a key composed of more than one column or attribute. It is also known as concatenated Key or structured Key.

All Keys other than Primary Key are composite Keys.

5) Foreign Key: It is a column in a table (parent table) that refrences a primary Key in another table (child table)

6) AlternatKey : It the Key that has not been Selected to be primarykey but are candidate Key. Or

Any candidate Key other than the one choosen as a primary Key is called alternate Key.
for ex- {id, name, address} are candidate Keys. Select (id) as primary Key & rest of candidate Key (name, address) are alternate Keys.

7) Secondary Keys
It is Key used to speedup the searches and retrieval. It does not necessarily contains unique values

Relational Schema

R(A1, A2, A3, A4 . . . . An)

is made up of Relation name (R) and the list of attributes

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called

re candidate
y & rest
are

he searches
ot necessarily

(R) and

Relation

Emp (id, name, address)

↳ defined as a set of tuples, let R be a relation which contains set of tuples ($t_1, t_2 \ldots t_n$). Each tuple is an ordered list of n values i.e
$t = (V_1, V_2, V_3, \ldots V_n)$

Integrity Constraints

- These are set of rules
- Used to maintain the quality of information.

Integrity constraint ensure that the data insertion, updating and other processes have to be performed in such a way that data integrity is not affected.

Thus, integrity constraint is used to guard against accidental damage to the database

→ Types of Integrity contraints:

Domain contraint can be Defined as the definition of valid set of values for an attribute.
The datatype of domain includes string, character, integer, time, date, etc.

Name	id	Age
abc	1	18
xyz	2	A → Not allowed.

PK is used, it can't be NULL

2. Entity Integrity Constraint

- The entity integrity contraint States that Primary Key value can't be NULL

- This is because PK value is used to identify individual rows in relation. and if the primary Key has a NULL value, then we can't identify those rows.

And if the primary Key has a null value we cannot identify those rows.

A table can contain a null value other than the primary Key field.

Name	id	age
abc	1	18
xyz	↓	12

NULL Not allowed

Referential Integrity Constraints.

Ename	eid	age	did
Shiwani	1	17	11
Ab	2	18	12
C	3	19	14 ←

NA

did	dname
11	a
12	b
13	c

A referential integrity constraint is specified b/w 2 tables.
In referential integrity constraint, if a foreign Key in table 1 refers to the primary

Key in table 2 , then every value of foreign key in table 1 must be available in table 2 .

4) Key constraint .

ename	eid
A	01
B	02
C	02 → Not allowed

i) Key are the entity set that is used to identify an entity within its relation uniquely.

Key constraints States that a primary Key must contain a unique value , it cannot have duplicate values

SQL Commands.

DDL	DML	DCL	TCL	DQL
Create	Insert	Grant	Commit	Select
Drop	Update	Revoke	Rollback	
Alter	Delete			
Truncate				

DDL - It change the structure of the table like creating , altering a table .

All changes are auto committed that is permanently saves all the change in database

- Drop - used to delete both structure & records stored in the table

Drap table tablename;

alter - used to alter structure ~~name~~ of the table / database. Change could be either to modify characteristics of existing attributes or to hide an attribute.

Alter table tablename
add colname definition; or
modify oldname newname;

Truncate - it is used to delete all rows from the table and free the space containing that table.

truncate table tablename;

2) DML - Data Manipulation Language

used to modify the database. It is responsible for all the forms of changes in a database

Commands are not autocommitted. They can be rolled back.

Delete → It removes all rows one at a time and holds an entry in transaction log for each deleted row.

Delete from emp wher id = 1;

3) DCL - used to grant and take back authority from any database user.

Grant - used to give user access privetely a database.

Revoke - used to take back permission from user.

4) TCL- Transaction control language. Can only be used with DML commands like insert delete update.

Commit; It is used to save all the transactions to the database.

Rollback: used to undo the transactions ~~that to a certain point without Rolling back entire transaction.~~ that have not already being save through the database.

Savepoint - use to roll the transactions that to a certain point without rolling back entire transaction.

Savepoint savepointname;
Roll back to savepoint;