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Enlity :-

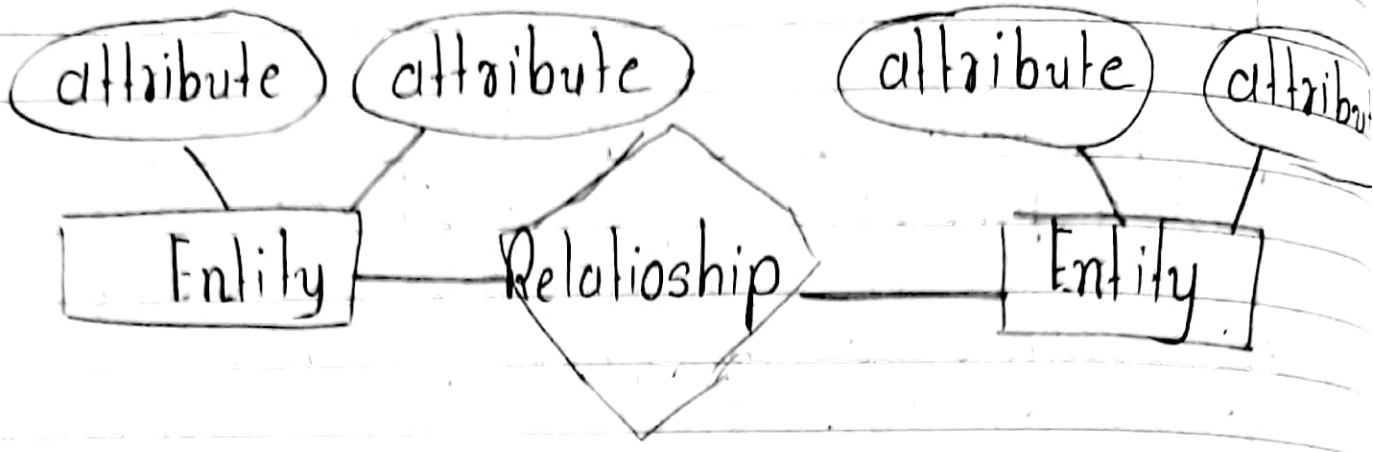
An Enlity in a E.R Modal is a real-world enlity having properlies called attributes. Every attributes by its set of Values called domain. for example in a school database, a student is considered as an enlily. student has various attributes like name, age, class, etc.

Relationship :-

The logical association among enlilies is called Relationship. Relationship are mapped with enlilies in various ways. Mapping Cardinlilies define the number of association beloeen two enlites.

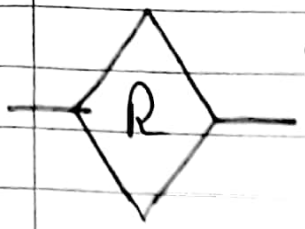
Mapping Cardinalities :-

- One to one
- one to many
- many to one
- many to many

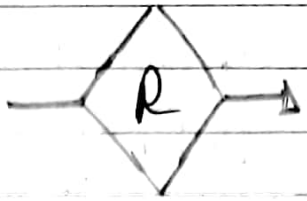


Notations

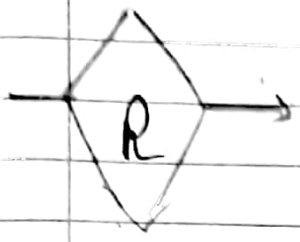
- Entity set
- Attribute
- Weak EntitySet
- Multivalued Attribute
- Relationship set
- Derived Attribute
- Identifying Relationship Set of weak entity Set
- total participation of entity set in Relationship
- primary key
- Discriminating Attribute of weak Entity Set



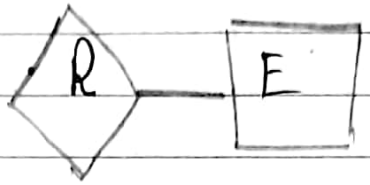
Many to many Relationship



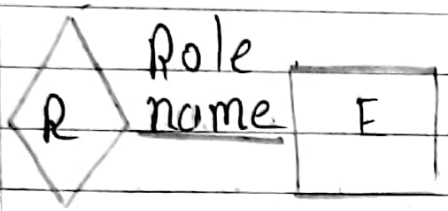
Many to one Relationship.



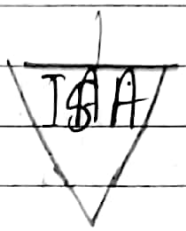
one to one Relationship



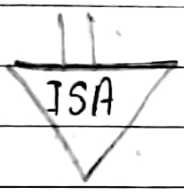
Cardinality Limits



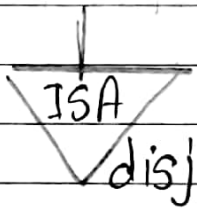
Role Indicator



ISA
(s.specialization or generalization)



total Generalization

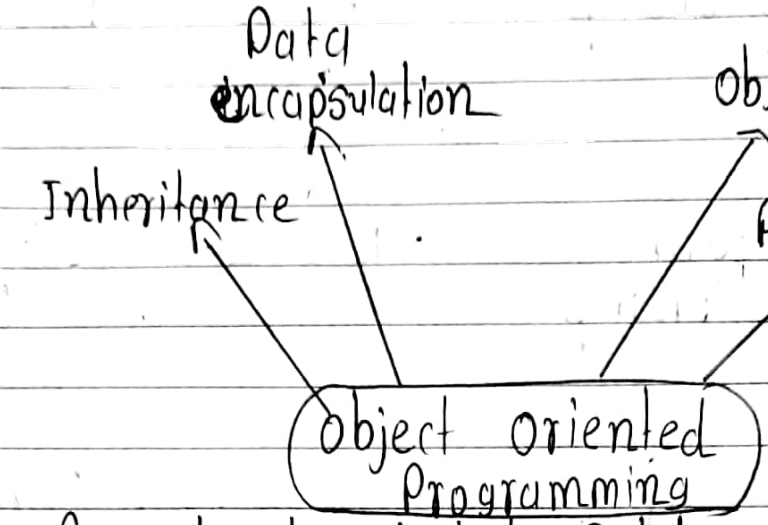


Disjoint Generalization

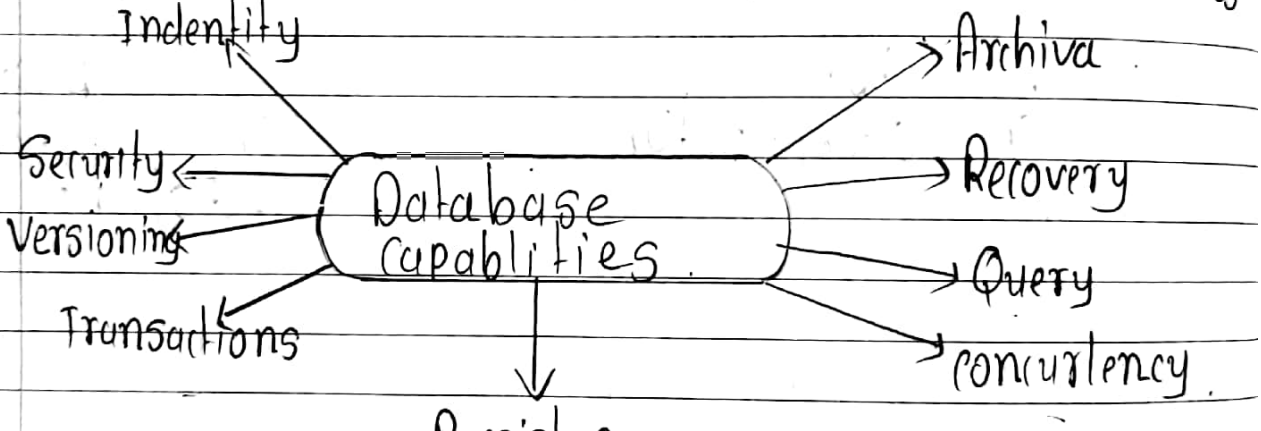
Object Oriented Database Modal

- The information here is in the from of the object as used in object oriented programming. it adds the database functionality to object programming languages.
- it Requires less code, use more natural data and also code bless are easy to maintain. Examples are objectDB

Object Oriented Model



An object-oriented Database is the marrige of object-oriented programming and Database Technology



Types of Database

- Based on the number of users.
- Based on the sites over which network is distributed.
- Based on the cost
- Based on the access.
- Based on the usage.

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Based on the number of users :-

(1) Single user :-

As the name it self indicates it can support one one user at a time. it is mostly used with the personal Computer on which the data resides accesible to a single person. The user may design maintain and write the database programs.

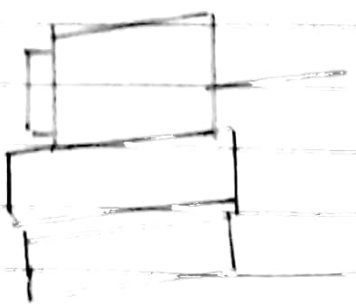
(2) Multiple user :-

It supports Mutiple users Concurrently. Data can be both integrated and shared, a database should be integrated when same information is not it need be recorded in two places. for example a student in the college should have the database containing his information. it must be accessible to all the departments related to him.

Based On the Sites / Location

1 Centralized database System :-

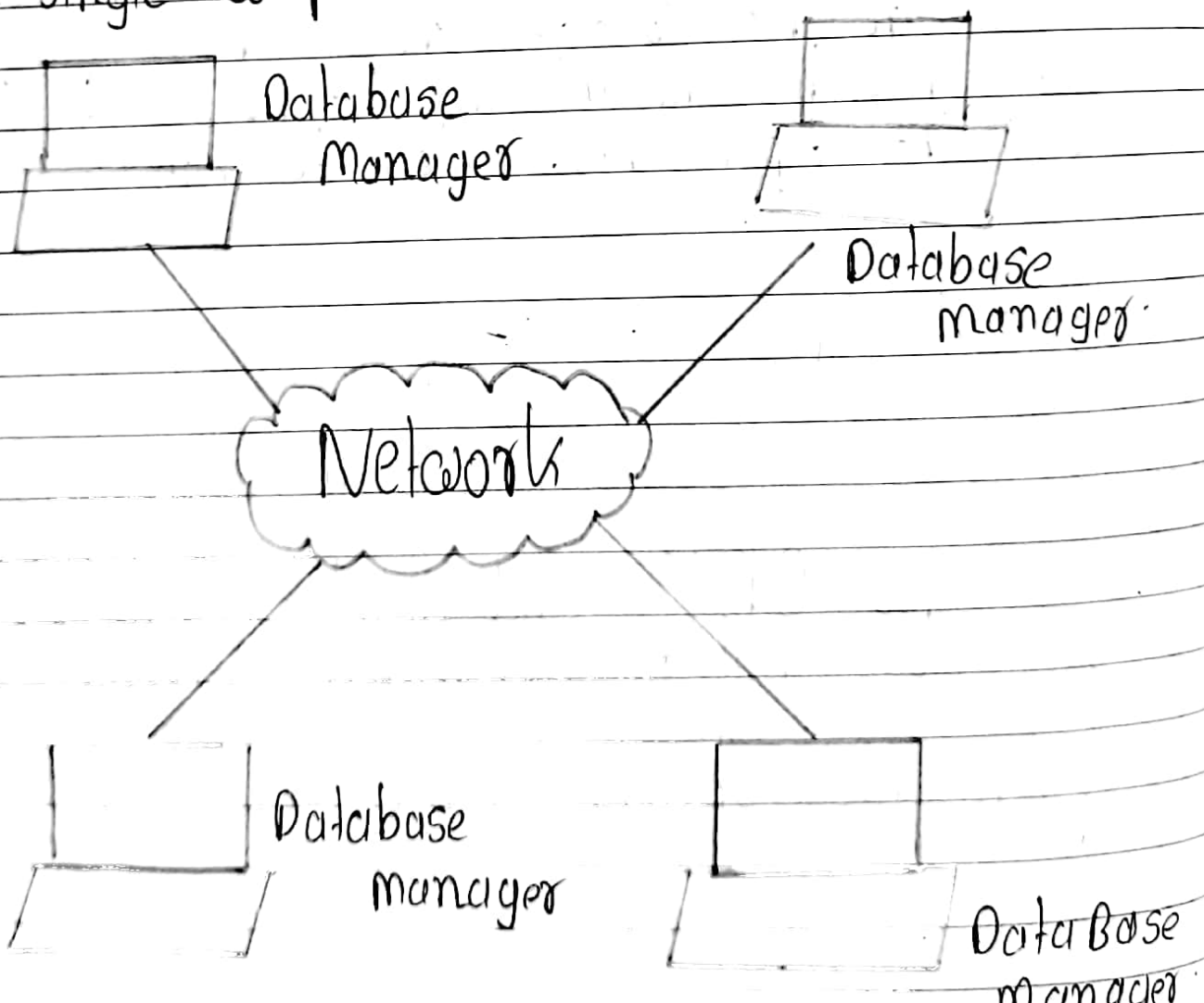
The DBMS and database are stored at the single site that is used by Several other Systems too. We can Simply Say that data here is maintained on the Centralized Server.



This System has the advantage of improving processing input and output speeds. Majourly used in the applications that have query to larger database. it holds the multiple central processing units and data storage disks in parallel.

(3) Distributed database System:-

In this data and the DBMS Software are distributed over several sites but connected to the single Computer.



1. Homogeneous DBMS:-

They use name software but from the multiple sites. Data exchange between the sites can be handled easily. for example library information Systems by the same vendor, such as Creac Computer Corporation use the same DBMS software that allows the exchanges between various Creac library sites.

2. Heterogeneous DBMS:-

They use diffrent DBMS software for diffrent sites but there is a additional software that helps the exchanges of the data between the sites.

Based on the sites/ Location:-

(4). Client-Server database System:-

This System is has two logical Components Namely client and Server. clients are generally the persnal Computers or workstations whereas Servers are the large Workstations Mini range Computers or a main frame Computer System. The applications and tools of the DBMS run on the client platforms and the DBMS Software on the Server. Both Server and client Computers are Connected over the network. We Can relate it to client and Server in real life to understand in a much better way. Here the applications and tools act as a client Send the Requests for the Services. The DBMS processes these Requests and Returns the Result to the client. Server handles jobs that are Common to many clients say database access and updates

(5) Multi-tier client-Server Database System :-

The Rise of personal computers in business has increased the Reliablity of the Network hardware leading to evalution of two-tier and three-tire Systems which use diffrent software for the client and software.

* Based on the Cost

- Low Cost DBMS - The cost of these systems Vary from $1000 to $3000.
- Medium Cost DBMS - Cost Varies from $10000 to $100000.
- High Cost DBMS - Cost of these Systems are usually more than $100000

* Based on the Access

→ This classification simply based on the access to data in the database Systems.

- Sequential access - One after the other.
- Dirent access
- Inverted file structures.

Based On The usage :-

- Online Transaction processing (OLTP) DBMS :-

They manage the operational data. Database Server must be able to process lots of simple transactions per unit of time. Transactions are inited in real time, in simulateous by lots of user and applications hence it must have high volume of short, simple quries.

- Online analytical processing (OLAP) DBMS :-

They use the operational data for tactical and stategical decision making. they have limited users deal with huge amount of data, Complex queries.

- Big data and analytics DBMS :-

To cope with big data new database technologies have been introduced. One such is NoSql (not only SQL) which abandons the well known Relational database scheme.

- XML DBMS :-

- Multimedia DBMS :-

Stores data such as text, images, audio, video and 3D games which are usally stored in binary large object

- GIS DBMS : stores and queries the spatial data.

- Sensor DBMS:
  Allows to manage sensor data. bio metric templates data

- Mobile DBMS
  Runs on the Smartphones, tablets. ... the local queries. Supports DBMS management in ca...

- Open Source DBMS:
  Code is publicly available and can be ... by anyone. popular for small business app...

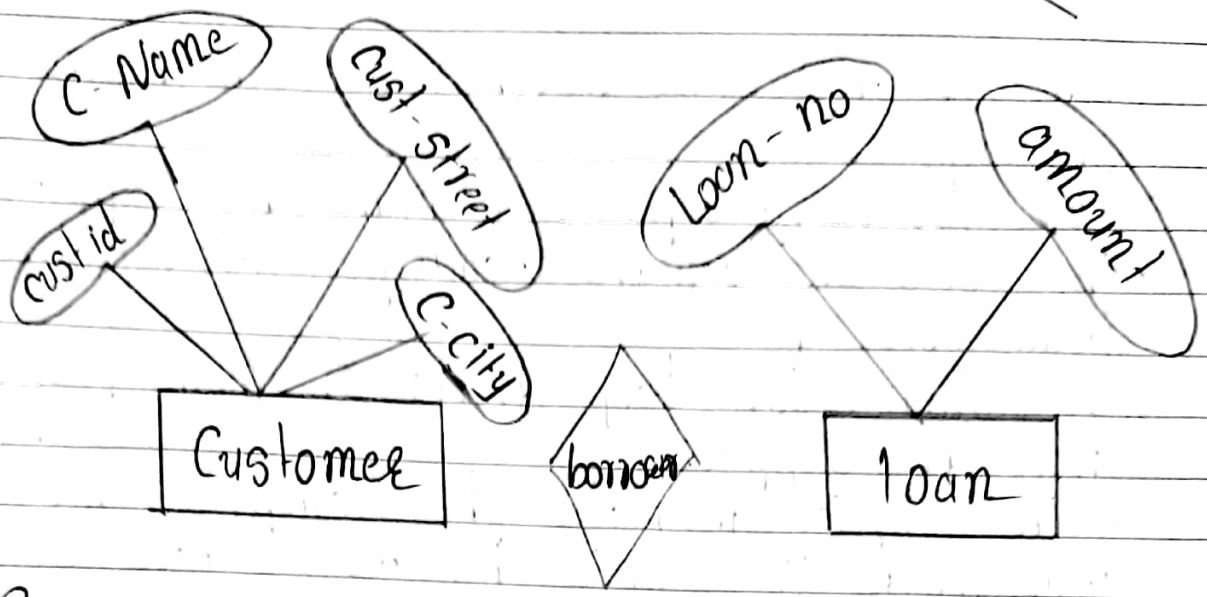
ER:

Basic Concepts:

- Entity Set: an collection of similar things
  eg. Cars, students
  → An entity set Consisting many entities

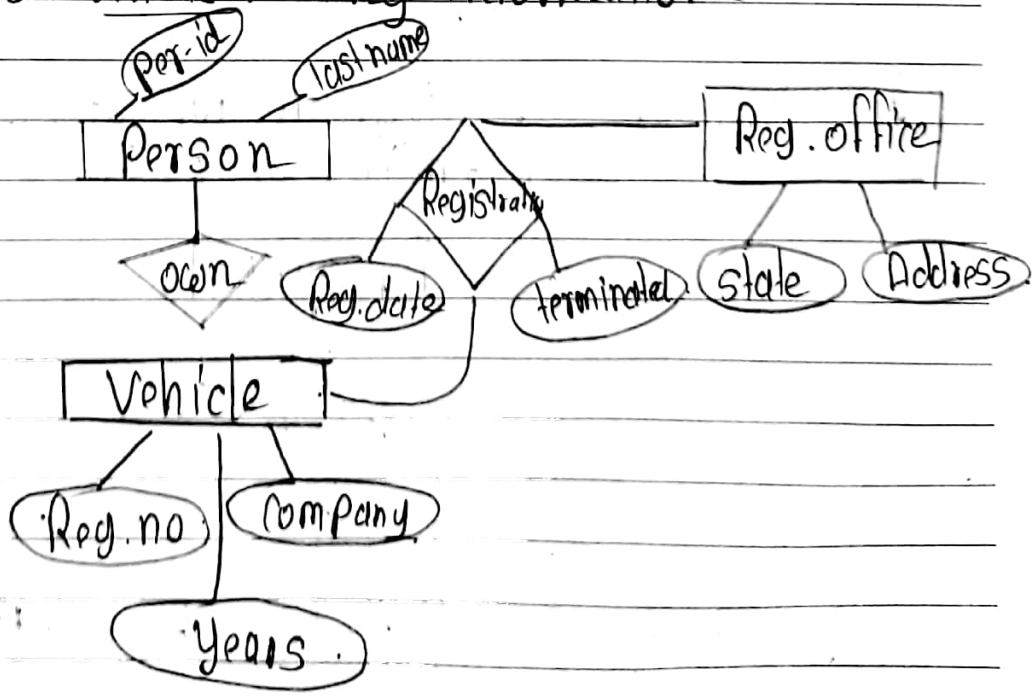
- Attributes: Common properties of the ... in a entity set

- Relationship: Shows the relations among entities more than two or more entity sets.

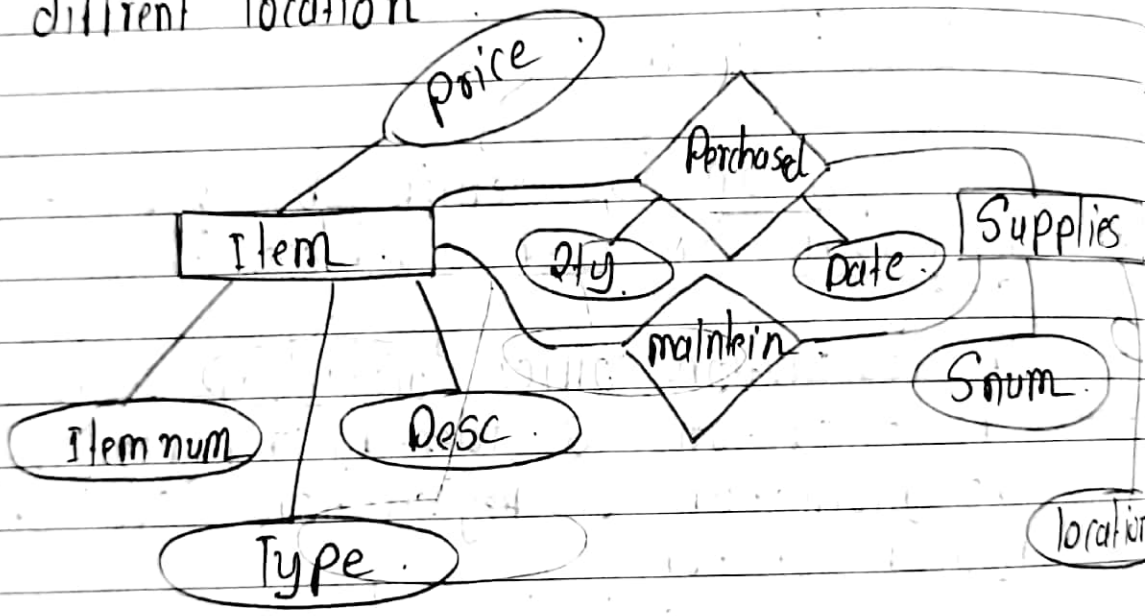


Er diagram

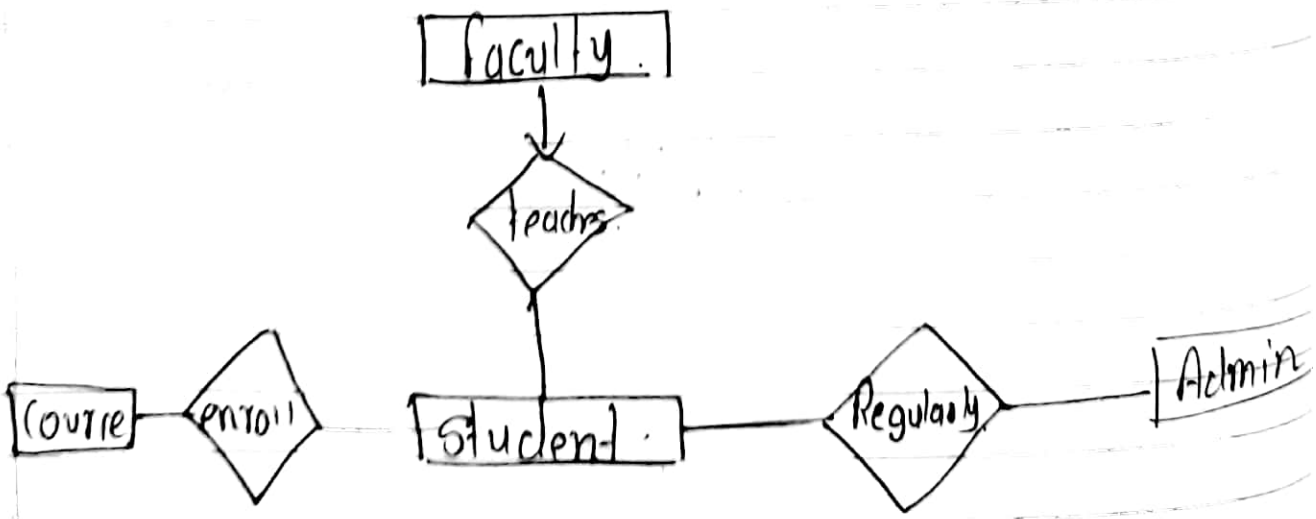
→ A person is identify by persant id and lastname
→ A person can own a vehicle which is Registerd in any state
→ The Registration office located in each state
→ The Registration is identify by Registration number.
→ The information of Registration Termination is Octain from Regestration
→ Each Vehicle has Vehicle making information



→ An organization perchases item from a number of Supplier
→ Each and every Supplier identyfy by Supplier number
→ The items are identyfy itemtype, discription, and itemnumber.
→ The organization keep drafts of item perchase from the Supplier.
→ Each Supplier mainlain the itemprise for each item which is Supplie by more then One Supplier from diffrent location



b. Draw an ER diagram for student information System
→ Entity Set



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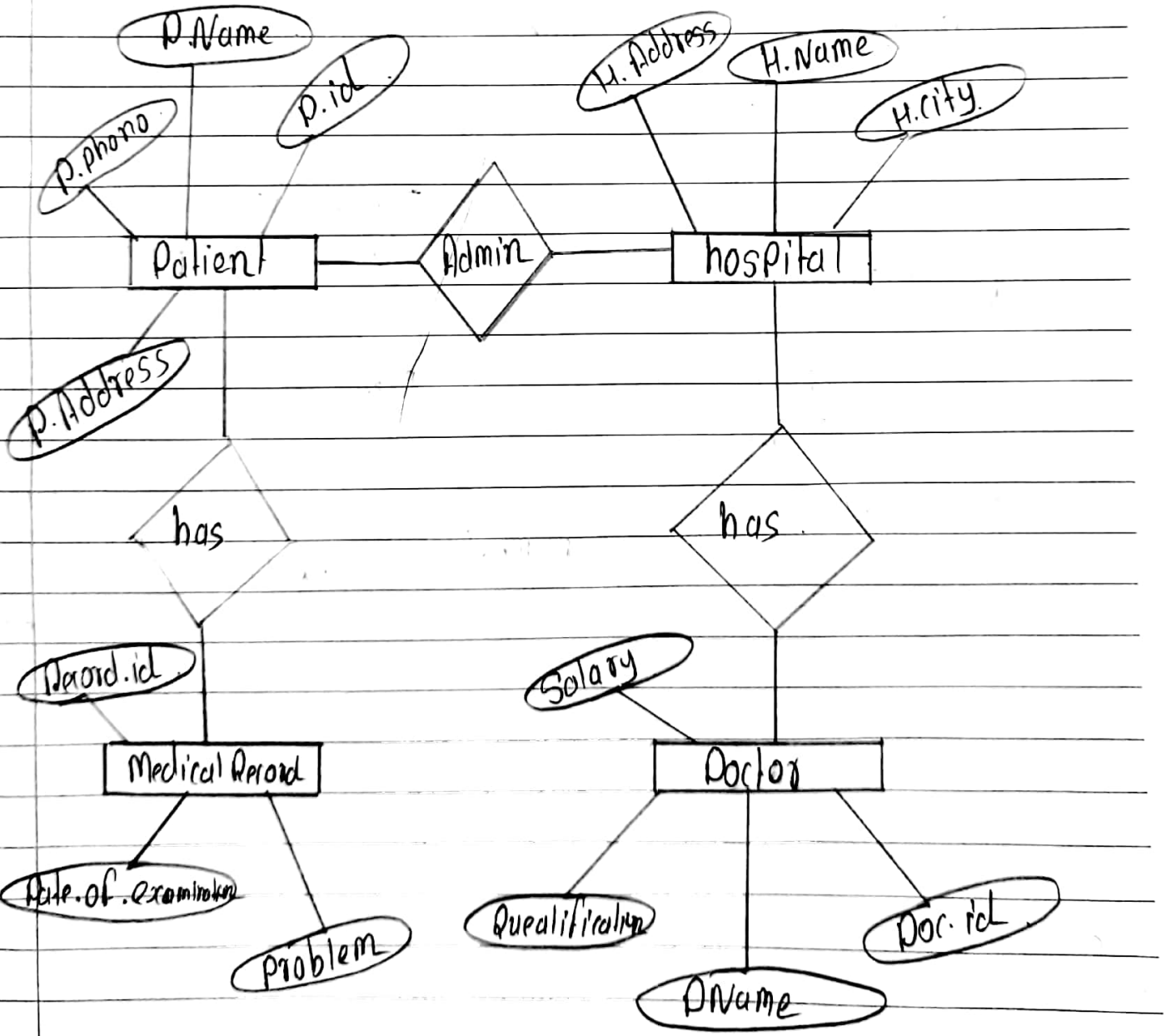
Q. Draw an ER diagram for Hospital Management

↳ Entity Set

hospital	Patient	Doctor
Hosid	(1) pName	D.salary
HosName	(2) p.id	D. Qualification
Hcity	(3) p. Address	D. id
Haddress	(4) P. Mobileno	D. Name
~~HosName~~		

~~Doctor~~ MedicalRecord → Record id, MR Date of examinati, Me. Problem



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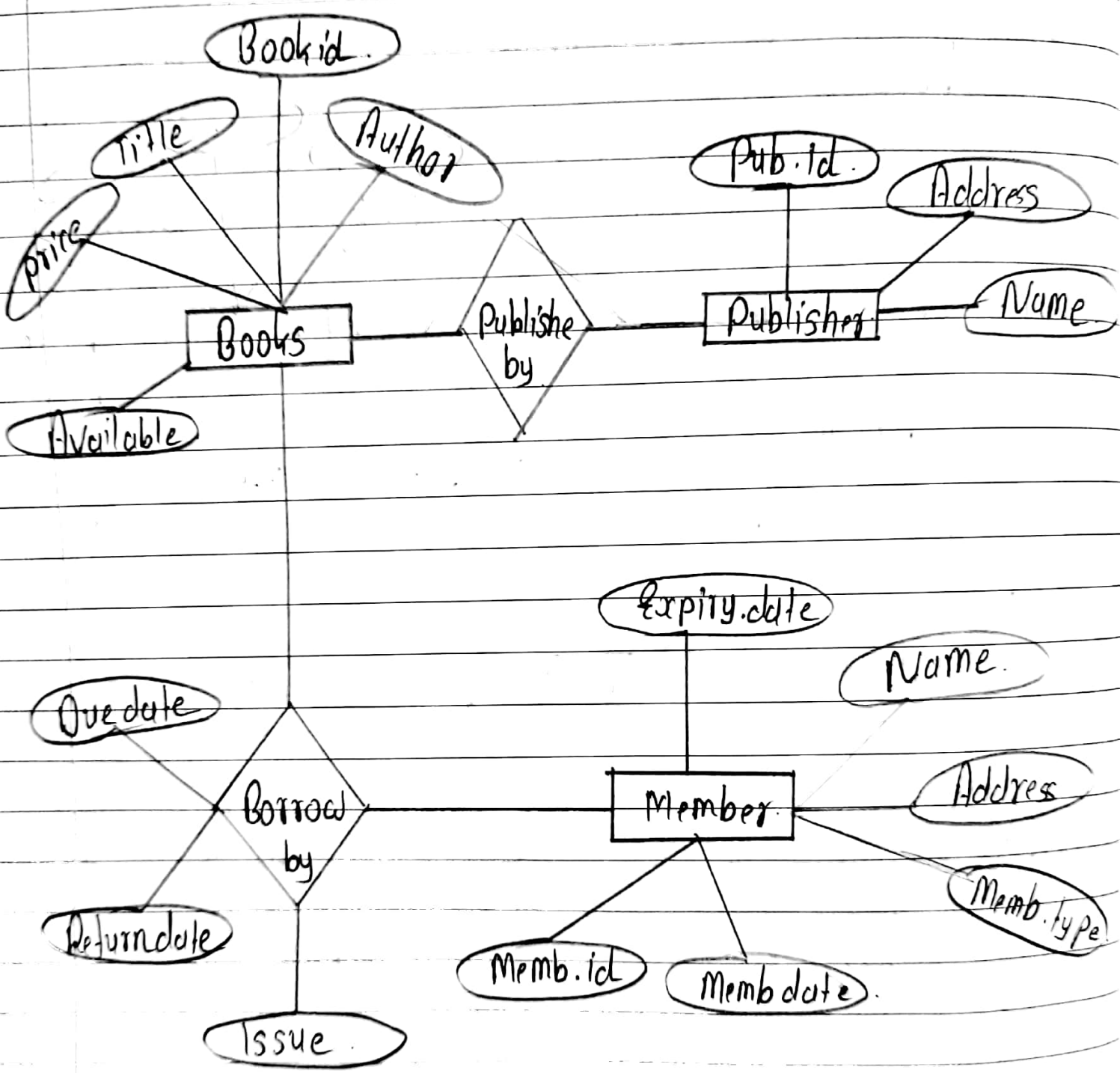
Er modal library :-



Entity Set and keys :-

- Key is an attribute or Collection of attributes that uniquly indentifies.
- For Example the roll_number of a student makes him/her identifiable among students.
- Super key :-
  A set of attributes (one or more) that collectively identifies an entity in an entity set
- Candidate key :-
  A minimal Super key is called a Candidate key. An entity set may have more than one Candidate key.
- Primary key :-
  A primary key is one of the Candidate keys chosen by the database designer to uniquley identify the entity set.
- Foreign key :-

A key which is primary in One Relation but Act as a Refrence too another Relation that attribute it is called foreign key.

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Attributes:-

- Entities are by means of their properties, called attributes All attributes have values for example a student entity may have name, class and age as attributes.

- There exists a domain or range of values that can be assigned to attributes for example, a student's name cannot be

Types of Attribute:-

- Simple Attribute:-

Simple attribute are atomic values, which can not be devided further for example, a student's phone number is an atomic of 10 digits.

- Composite Attribute:-

Composite Attribute are made of more than one simple attribute. for example. a student's complete name may have first name and last name.

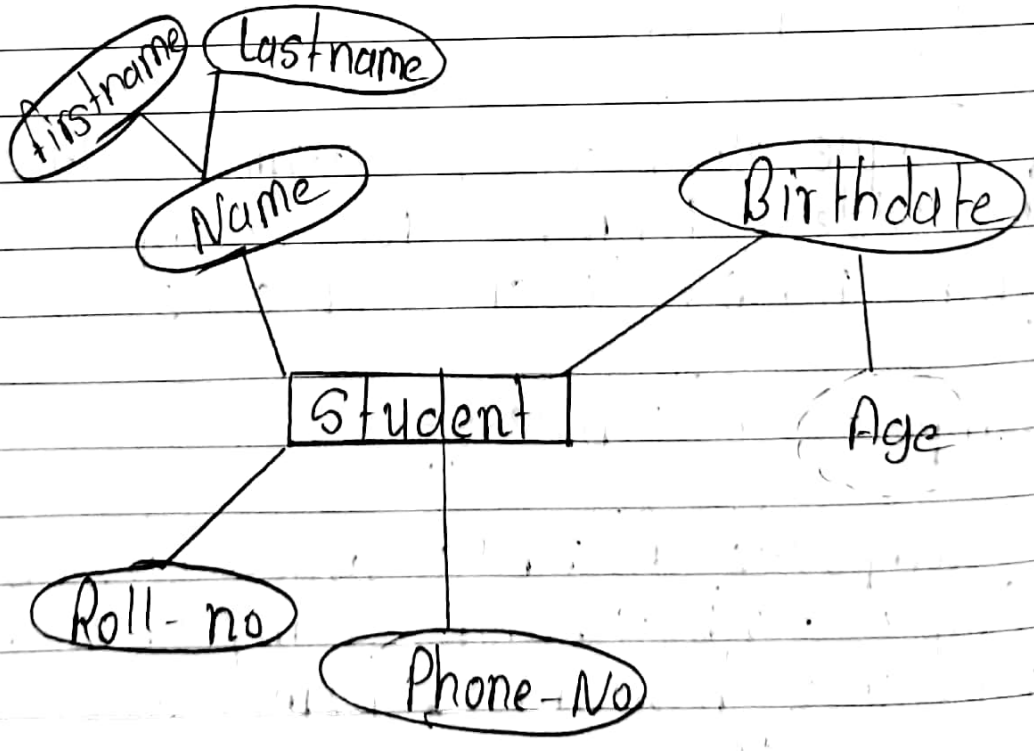
- Derived attribute:-

Derived attributes are the attributes that do. Exist in the physical database but their values are derived from other attributes present in the

database. For example, average — Salary in a department should not be saved directly in the database, instead it can be derived for another example, age can be derived from date-of-birth.

- Single Value attributes :-
Single Value attributes contain single value for example - Social Security - Number.

- Multi - Value attributes :-
Multi - Value attributes may contain more than one value for eg. a person can have more than one phone number email - address etc.



Degree Of A Relationship

M.I.MP

- The degree of a Relationship is the number of Entities associated or participate in one Relation

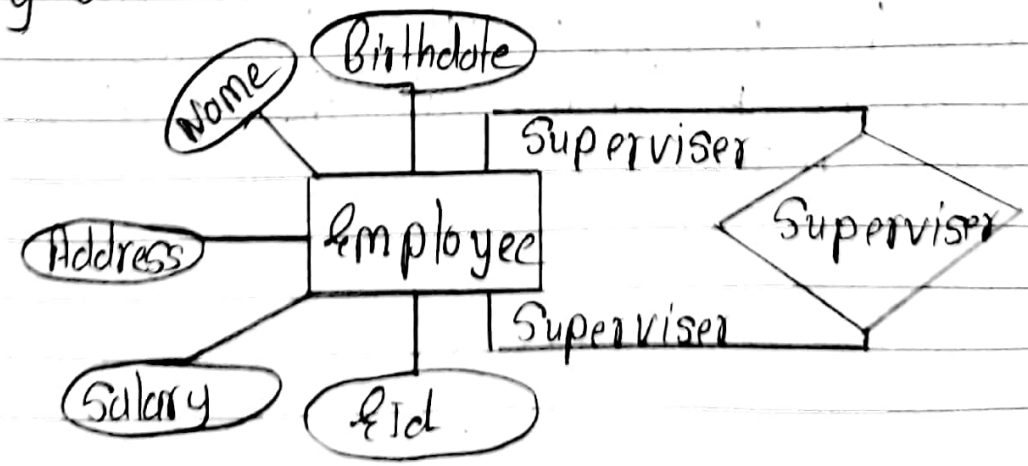
- Unary or Recursive Relationship
- Binary Relationship
- Ternary Relationship
- N-ary Relationship

M.I.MP

* Unary Relationship :-

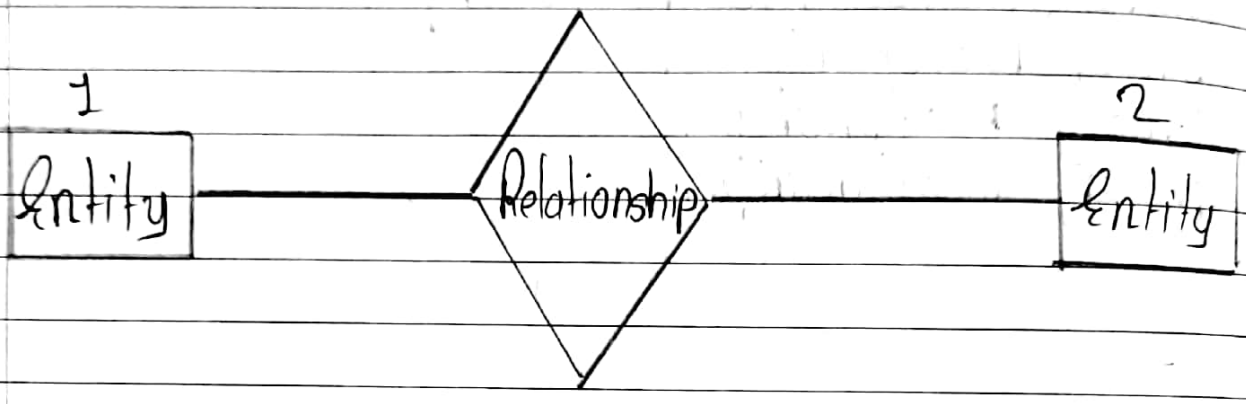
→ One in which a Relationship exists between Occurrences of the Same entity set. The two keys (primary key and foreign key) are the Same but they Represents two entities of diffrent Roles Rolate to this Relationship.

→ In Some entities, a Seprate Column Can be Created. that Refers to the primary key of the Same entity Set



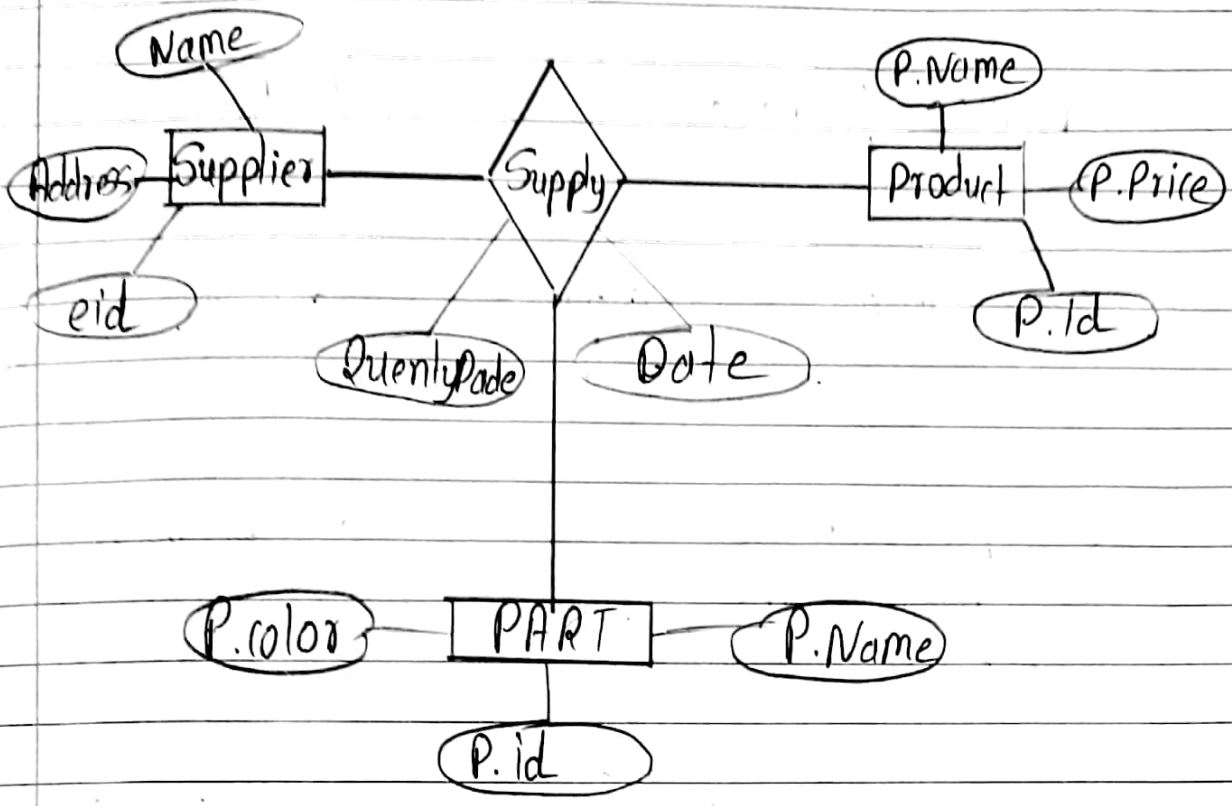
Binary Relationship :-

- The Relationship between two entities are called binary Relationship.



* Ternary / N-ary Relationship

- Mapping Ternary Relationship Type: for each n-ary (> 2) Relationships creats a new Relation to Represent the Relationship. The primary key of the new Relation is the combination of the primary keys of the participing entities that hold the N (many) Side. In most cases of an n-ary Relationship all the participing entities hold a many Side.



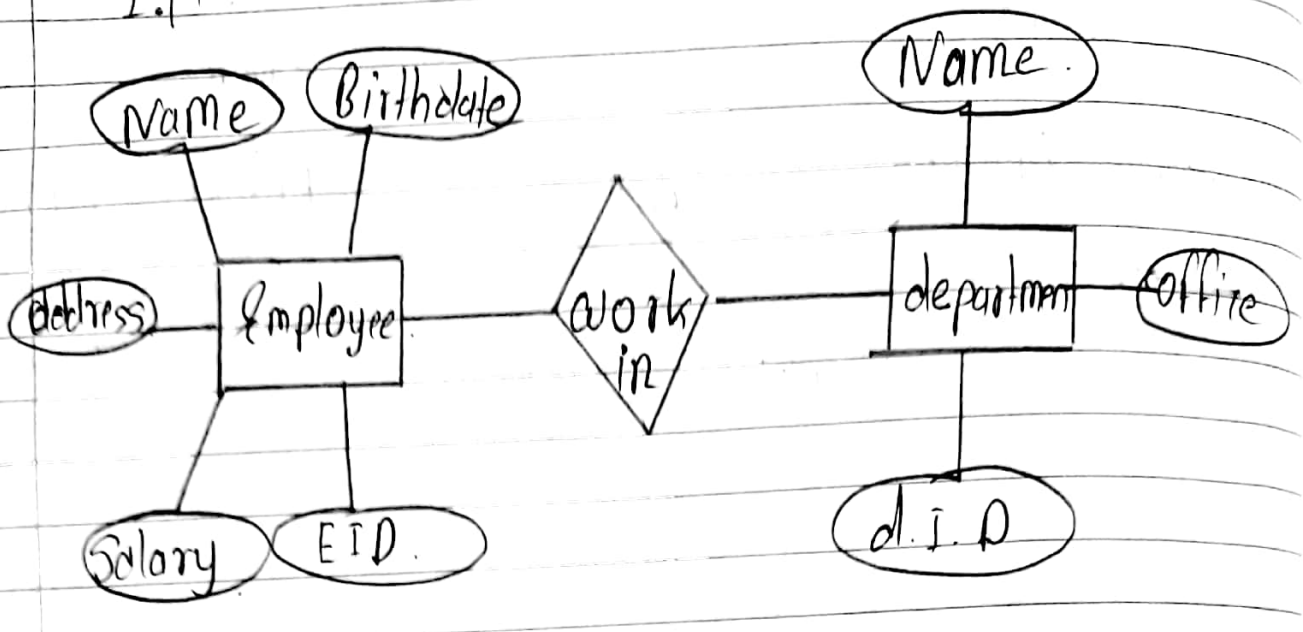
Connectivity of a Relationship

- 1.1
- 1.M
- M.N

* 1.M :-

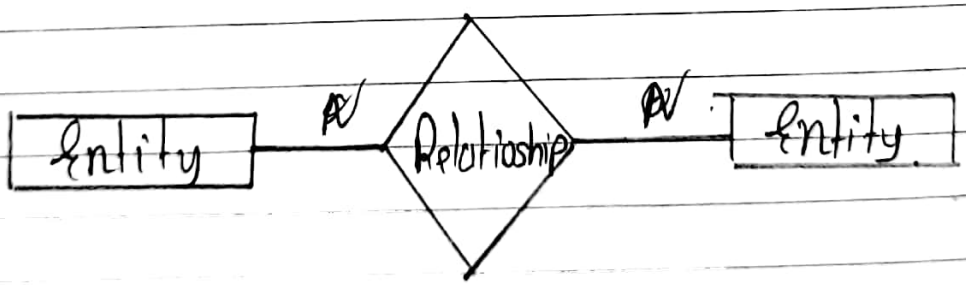
→ When more than one instance of an entity is associated with a Relationship, it is marked as 1.M The following it is marked as. 1.M Reflects that only one instance that only one instance of entity and more than one instance of an entity can be associated with the Relationship. It depicts one-to-many Relationship.

1.M



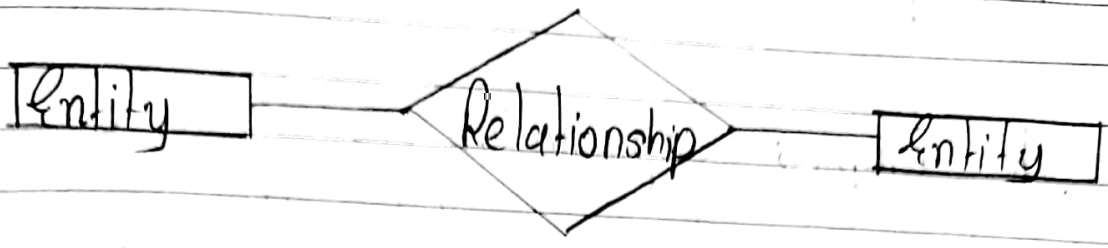
* 1:1

→ When only one instance of an entity is associated with the Relationship it is marked as '1:1'. The following image Reflates that only one instance of each entity should be associated with the Relationship. it depicts many to many Relationship.



M. M :-

The following image Reflects that more than one instance of an Entity on the left and More than one instance of Entity on the right can be associated on the right can be associated with the Relationship. It depicts Many to Many Relationship.



Existence of Relationship :-

→ A Relationship, in the Context of databases, is a situation that exists between two Relational database tables when one table has a foreign key that References the primary key of the other table. Relationship allow Relational databases to split and store data in diffrent tables, while linking disparate data items.

Constraints :-

- Every Relationship has Some Constraints that limits the possible Combination of Entities.
- Multiplicity Constraints
- Cardinality Constraints
- participation Constraints
- Exclusive and uniqueness Constraints

Multiplicity Constrains.

- The simplest explaination would to be say:

  Mutiplicity = Cardinality + participion.

- Cardinality:

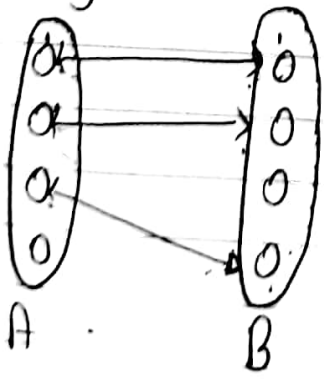
  Denotes the maximum number of possib Relationship occurnes in which a certain entity can partcipate (in simple terms: at most:)

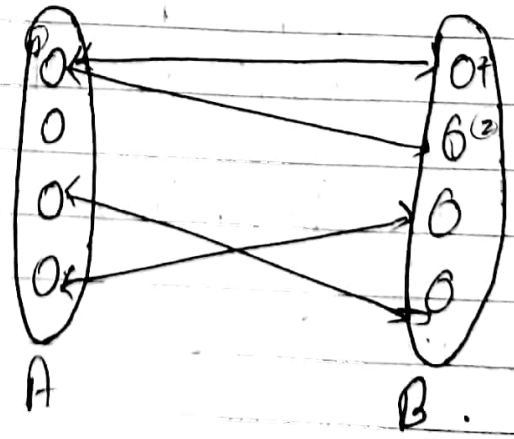
- Participaion:-

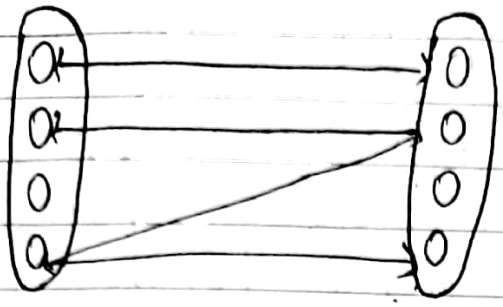
  Denotes if all or only some entity occurrences participate in a Relationship

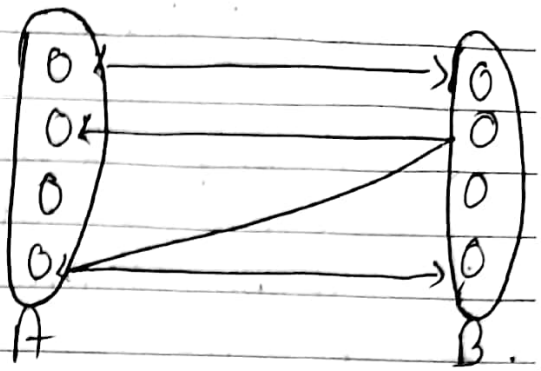
Cardinality Constraints:-

- it constrais number of instance of an entity is associated with each instance of other entity.





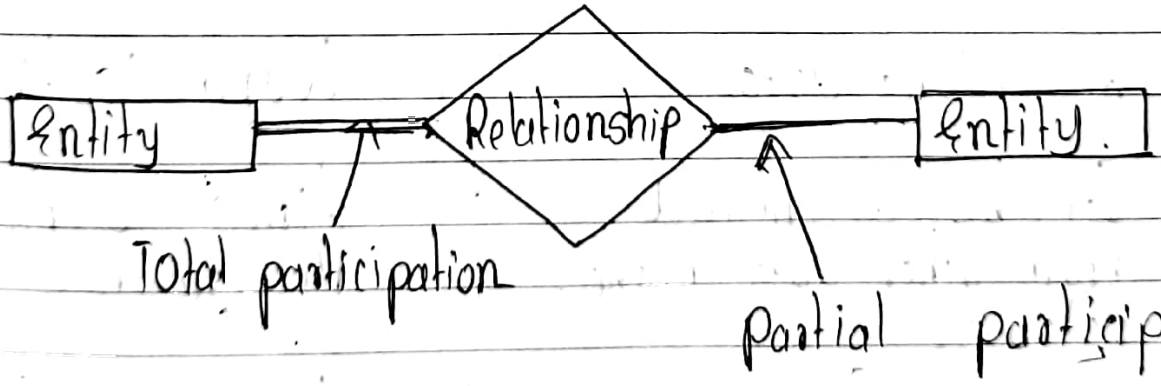




Particiption Constraints

- Total particiption: Each entity is involved in the Relationship total participation is represented by double lines.

- Partial Particiption :- Not all entities are involved in the Relationship. partial participation is Represented by Single lines.



Exclusive and Uniqueness Constraints

- A Unique Constraint is a type of column Restrition within a table, which dictates that all Values in that column must be unique though may be null.

- To Ensure that a column is UNIQUE and Cannot Contain null values the column must be specified as NOT NULL interestingly, these are a primary key's two main attributes. Defining both attributes in a newly-created column should be given Serious serious Consideration for the primary key designation

Unit: 3

Redundancy and Normalisation

- Redundant data

→ Can be determined from other data in the database

→ Leads to Various ploblems

→ INSERT anomalies.
→ UPDATE anomalies.
→ DELETE anomalies.

- Normalisation

→ Aims to Reduce data Redundancy.

→ Redundancy is expressed in terms of dependencies.

→ Normal forms are defined that do not have certain types of dependency.

First Normal Form

- In most definitions of the Relational model
- All the data values should be atomic
- This means that table entries should be Single Values, not Sets or Composite objects.
- A Relation is said to be in first Normal form (1NF) if all data Values are atomic

Normalisation to 1NF

To Convert to a 1NF Relation, Split up any non-atomic Values.

Unnormalised

Module	Dept	Lecture	Texts
M1	D1	L1	T1, T2
M2	D2	L2	T1, T3
M3	D3	L3	T4
M4	D4	L4	T1, T5
M5	D5	L5	T6
M6	D6	L6	

Module	Dept	Lecture	Text
M1	D1	L1	T1
M1	D1	L1	T2
M2	D1	L1	T1
M2	D1	L1	T3
M3	D1	L2	T4
M4	D2	L3	T1
M4	D2	L3	T5
M5	D2	L4	T6

Problems in 1NF

→ INSERT anomalies
- Can't add a module with no leads.

→ UPDATE anomalies.
- To change lecture for M1, We have to change two rows.

→ DELETE anomalies
- If we remove M3, we Remove L2 as well.

problems in 1NF

- insert anomalies:-
- Can't add a module with noleads.

Update anomalies:-

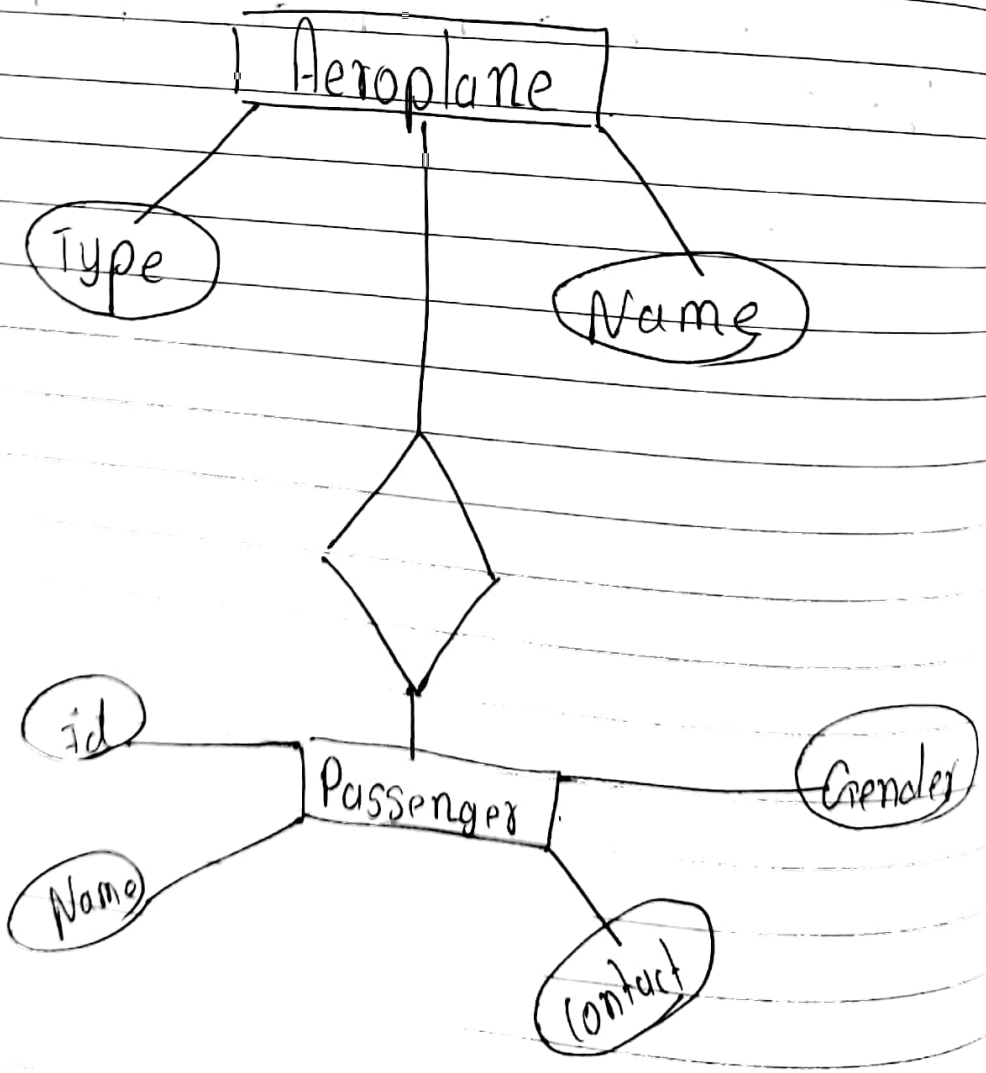
→ To change lectured for, M_1, we have to change two rows.

DELETE anomalies:-

→ If we remove M_3, we remove L2 as well.

E-r model
For Airline Management System :-

Entities	Attributes
- Airhostleses	→ (1) Name (2) contact
- Department	
- Captain	→ (1) Name (2) contact
- staff member	→ (1) Name (2) contact
- ~~Hotel~~ food management	→ (1) f.N (2) [.ype (3) [.p
- passenger	→ (1) Name (2) id (3) cor
- Aeroplane	→ (1) Terminal (2) Termin
- Ticket	→ (1) Number (2) price (3) N



Third Normal Form

Module	Dept	Lecture
M1	D1	L1
M2	D1	L1
M3	D1	L2
M4	D2	L3
M5	D2	L4

* 2NFa is not in 3NF

* We have the FDs
  {module} → {lecture}
  {Lecture} → {Dept}.

* So there is a

2NF to 3NF - Example:-

Module	Dept	Lecture
M1	D1	L1
M2	D1	L1
M3	D1	L2
M4	D2	L3
M5	D2	L4.
M6		

Lecture	Dept
L1	D1
L2	D1
L3	D2
L4	D2.

Module	Lecture
M1	L1
M2	L1
M3	L2
M4	L3
M5	L4

Problems Resolved in 3NF

2NFa

* Problems in 2NF

* INSERT - Can't add lectures who teach no modules.

* UPDATE - To change 3NFa the department for L1 we must alter two rows.

* DELETE = If we delete M3 we delete L2 as well

* In 3NF all of these are Resolved (for this Relation but 3NF can still have anomalies)

3NFa

Lecture	Dept
L1	D1
L2	D1
L3	D2
L4	D2

Module	Lecture
M1	L1
M2	L1
M3	L2
M4	L3
M5	L4

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Boyce - Codd Normal Form (BCNF)

* BCNF is in refinament of the third normal form in which it drops the restriction of a non key attribute from the 3rd normal from

* Third Normal form and BCNF are not Same if the following Conditions are true;

→ The table has two or more Candidate keys
→ At least two of the Candidate keys are Composed more than one attribute
→ The keys are not disjoint. i.e The Composible Candidate Some attributes.

Example 1 - Address (Not in BCNF)
Scheme → {City, street, zip code}

BCNF - Decomposition

1. place the two Candidate primary keys in Seprate entities.

2. place each of the remaining data items in one of the Resulting entities acording to its dependency on the primary key.

Example 1 (Convert to BCNF)

Old scheme → {City, street, zipcode}
Alternate New scheme 1 → {zipcode, street}
Alternate New scheme 2 → {zipcode, city}