DATABASE MANAGEMENT SYSTEM

NOTES

SERIES -1

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Introduction to DBMS

Data :- Data is raw facts.

Information :- Processed data is information.

Database (dB) :- Related information placed in an organised manner.

e.g - Employee database

DBMS (Database Management System) :-

It is a collection of programs (Software) that enables user to create and maintain a database.

Characteristics of Database Approach Vs File processing Approach :-

① Self describing nature of a dB System :-

→ The dB system contains not only that dB itself but also the complete description of the dB structure and constraints impose on the dB stored in a DBMS Catalog.

→ The information stored in a catalog is called a metadata i.e data about data.

② Data Dependancy :-

→ In file based system records and files are described in a specific format. If the format of a certain record is changed, the code in each file containing that file must be updated.

→ Hence changes to storage structure or access method can affect method of an application.

③ Separate View for Separate Users :-

→ Each User may require different view of data.
→ The view is the subset of whole database.
→ The DBMS having users in multiple application must support the view concept.

④ Sharing of data by Multiple Users :-

→ Multi DBMS must allow multiple user to share the same database at a particular instant of time.
→ This is taken care by concurrency control scheme of DBMS.

⑤ Reduction of Redundancy :-

→ The margin of reduction of duplicacy of data in DBMS is quite high as compared to file system.
→ In a file system, all applications have their own private files which can't be shared, thus resulting in data redundancy.

DATAMODEL, SCHEMA AI

Types of Users who works on DBMS System :-

① Native Users :-

(i) Need not have to be aware of the presence of dB System.
For e.g → When the user use the ATM, he/she doesn't know about the database made for the ATM system in the background.

(ii) They are also called end users and work on a menu-driven program.

② Application Program :-

(i) They interact with the system through DML calls. which are embedded in a program within in a host language like C, COBOL e.t.c

(ii) They are aware of the presence of dB.

③ System Analyst :-

(i) They possess higher degree of expertise.

(ii) Interacting with system without writing programs. rather they form their own request in a dB query. language or commands available for respective dB.

④ DBA (dB administrator) :-

(i) DBA's job require the highest level of technical expertise

ii) It makes the decision what data are to be stored in dB.

iii) decides how data is stored in dB.

iv) must provide supports to users by making the data available to them when they are in need.

v) ensures security & integrity check so that no unauthorized users are allowed to access dB.

vi) Implement appropiate backup and recovery strategy to recover data from dB whenever there is a failure

(vii) must monitor System performance which is best for the organisation.

(viii) Has all the System privileges of DBMS & Grants and revoke level of access rights.

DATAMODEL, SCHEME AND INSTANCES

DATABASE SCHEMA :-

Schema is defined as a outline or plane that desc the records & the relationship exhibiting at a partic level.

→ A Schema doesnot Contains all the constraints. Some constraints like datatype specification; size e.t.c are no present in a dB Schema.

Roll	Name	Branch	Address	Age
–	–	–	–	–
–	–	–	–	–
–	–	–	–	–
–	–	–	–	–

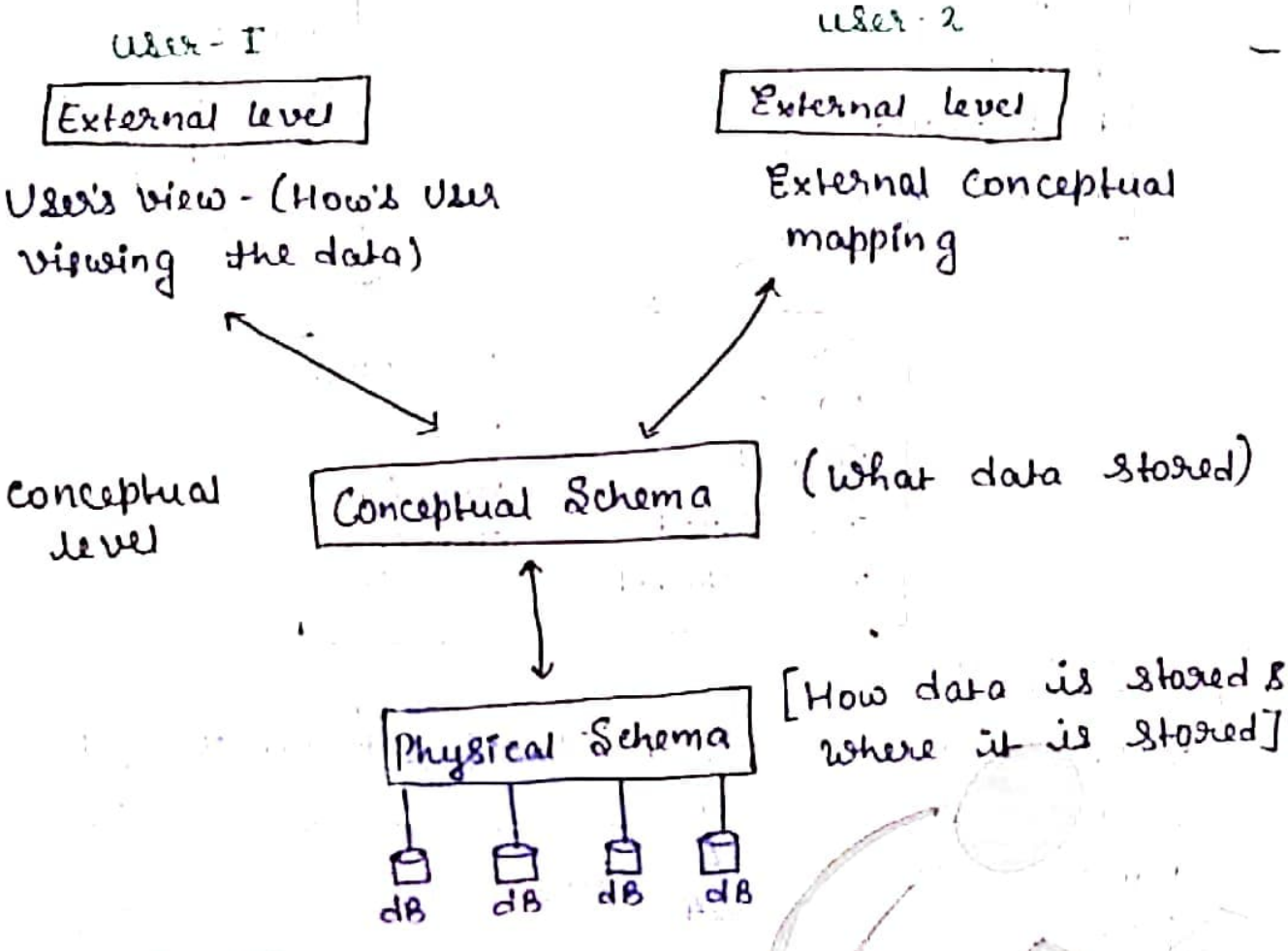
STU Schema

Roll	Name	Branch	Address	Age

DATABASE INSTANCES :-

The data in dB at a particular moment of tim which is called a snapshot or dB State or instanc or Current set of occurences.

THREE SCHEMA ARCHITECTURE



FIRST LEVEL

External level or view level :-

→ Each external schema describes the path of the dB that a particular User is interested in.

→ Same dB can have different views for different Users.

Conceptual level :-

→ It describes what data is stored in the dB.

→ Concentrates on describing entity, datatype, relationship Constraints.

Internal level or physical Schema :-

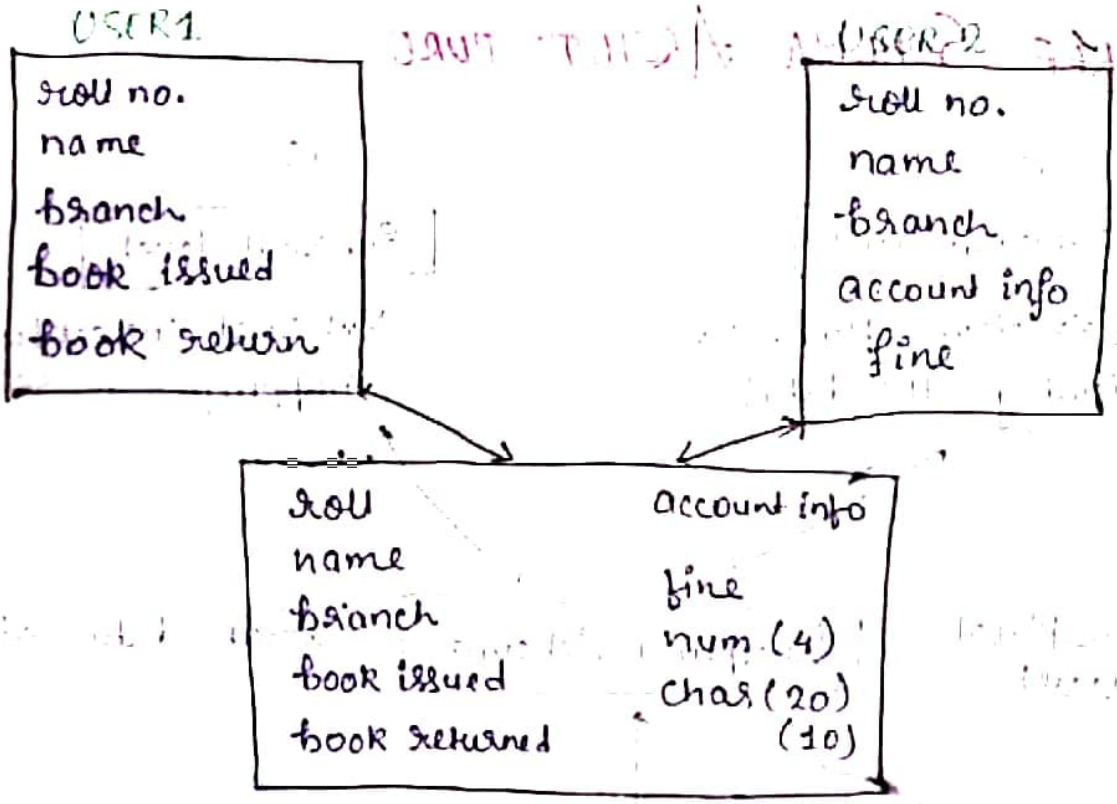
→ Describes physical storage structure in dB.

→ Describes how data is stored in dB.

→ This level represents —

Storage space allocation of data

record description for storage.



Physical Level :—

field	size	Offset (Stored dist address of data)
roll	4	0
name	20	4
branch	10	24

Objective of 3-Schema Architecture :—

It separates each users view of the database from t way the database is physically represented i.e to achi Data Independence.

The ability to change the schema at the level of the database without affecting its subsequent higher level is c as DATA INDEPENDENCE.

Types of data Independence (DI) :—

(i) logical D1
(ii) physical D1

LOGICAL D1 :—

Capacity to change the Conceptual schema without having to change the external schema.

PHYSICAL D1 :—

Capacity to change the internal schema without aff the Conceptual schema.

DATA MODEL :—

→ Data models are collection of concepts for describing data, data relationship, data schemantics and the consistency constraints.

→ Types of data models :—

(i) object based logical model
(ii) Record based logical model.
(iii) Physical Model

Physical Model :— (i) Unifying memory.
(ii) frame memory model.

Object based logical Model :—

① Entity relationship model (E-R)
② object oriented model.
③ Schematic data model.
④ Functional data model.

Record based logical Model :—

① Relational Model
② Network Model
③ Hierarchical Model

E-R MODEL (Entity Relationship Data Model) :—

→ It consists of a collection of basic object called entities and the relationship existing among these objects.

Object - Oriented MODEL (O-O MODEL) :—

→ It is based on collection of object.
→ The objects may contain instance variable and methods
→ Objects that consists of same type of values and methods are grouped together into a class.
→ The only way in which two object can communicate with one another is through message passing.

RELATIONAL MODEL :—

→ The data is stored permanently in the form of tabular structure consisting of rows and columns.

→ Each table has multiple fields with unique name.

→ The cross-section of every row in a table must produce atomic value (single value)

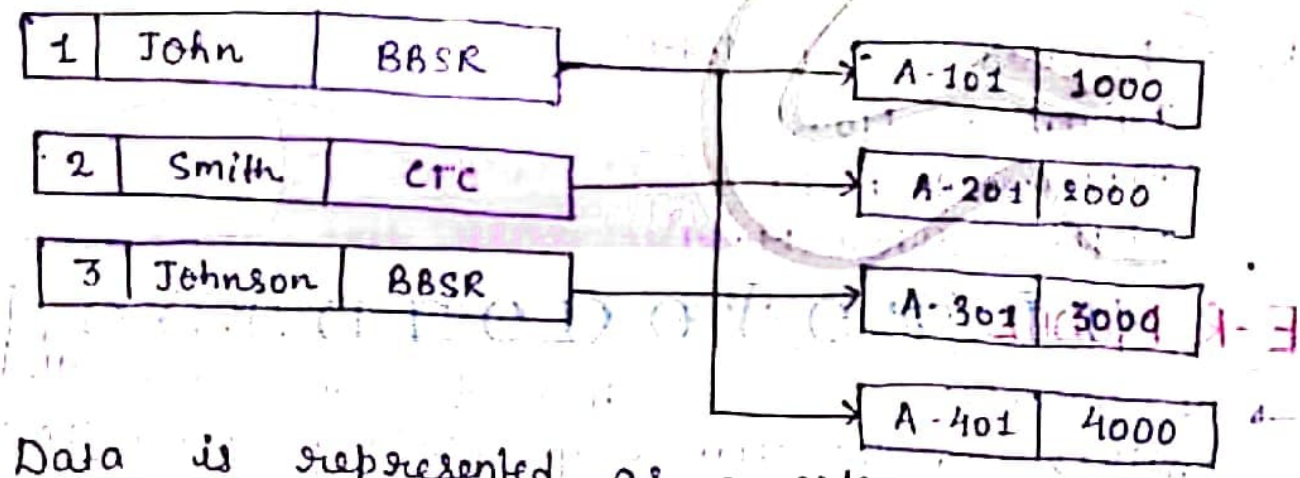
CUSTOMER

SSN	Name	City	Acno.
1	John	BBSR	A-101
2	Smith	CTC	A-201
3	Johnson	BBSR	A-301
4	John	BBSR	A-401

BALANCE

Acc no.	Balance
A-101	1000
A-201	2000
A-301	3000
A-401	4000

NETWORK MODEL :—



→ Data is represented as records.

→ Relationship between data is represented by links which is viewed as pointers.

→ The records in the database are organised as collection of arbitrary graphs.

HIERARCHICAL MODEL :—

Data is organised as records.

The only difference from network model is that records are organised as collection of trees instead of arbitrary graphs.

ATTRIBUTES :-

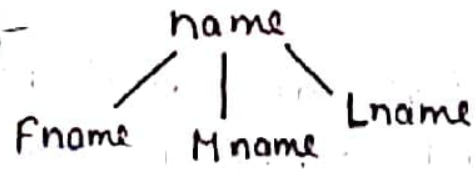
Attributes are the properties that describe an ent
e.g :- Student entity the attribute are rollno., na
branch e.t.c.

Types of Attributes :-

(I) Composite Attribute :-

It can be divided into smaller subparts, each can form an independent attributes.

e.g :-



(II) Simple/Atomic Attribute :-

Attributes that cannot be further subdivided
e.g :- PIN Code

(III) Single Valued Attribute :-

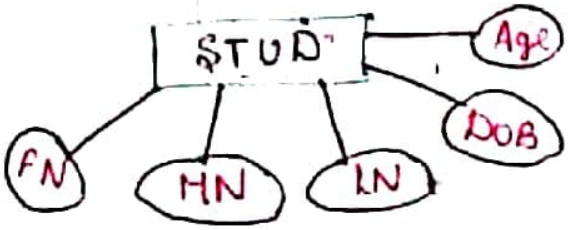
Attribute having a single value for a particular
e.g :- Room no.

(IV) Multivalued Attribute :-

Attribute having set of values for single e
e.g - E-mail Id, hobby, Tel. No.

(V) Derived Attribute & Stored Attribute :-

When one attribute value is derived from the
e.g - Age can be derived from, DOB.
where, age - derived attribute.
DOB - Stored attribute



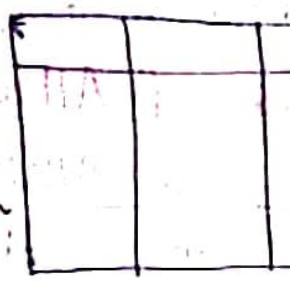
(VI) Complex Attribute :-

Nesting of Composite and multi-valued attrib
forms a complex attribute.

ENTITY TYPE AND ENTITY SET :—

Entity set is the collection of all entities of a pa
entity type is the dB at any particular instant of

e.g- Student, employee



Entity type is a set of attributes from an entity set which are generated for a specific condition.

e.g- List of all student having CGPA within 7.0 - 8.0.

KEY ATTRIBUTE :—

An entity type usually has an attribute whos are distinct for each individual entity in the entity an attribute is called a key attribute.

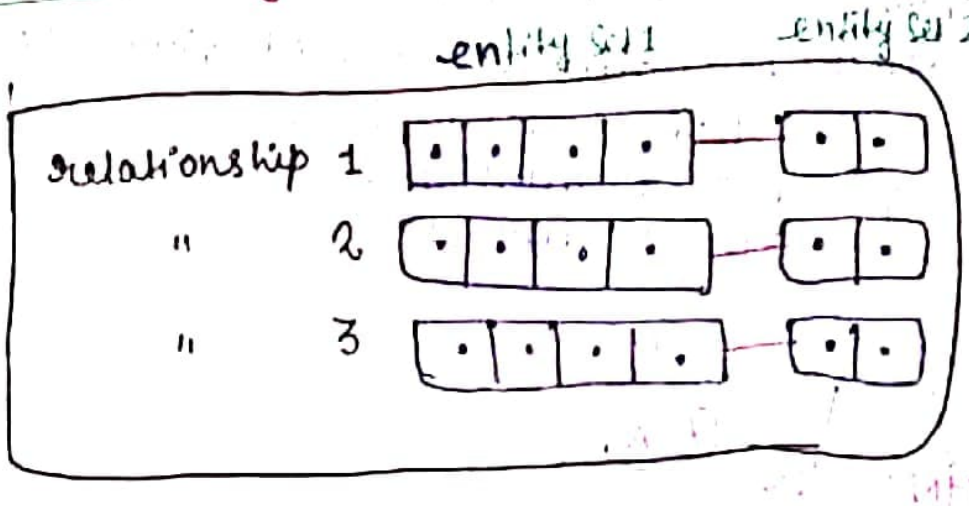
e.g - Regd. No.

DOMAIN OR VALUE SET :—

DOMAIN

For each attribute of an entity type is associa a value set or domain of a value which specifies of values that may be assigned along with its d

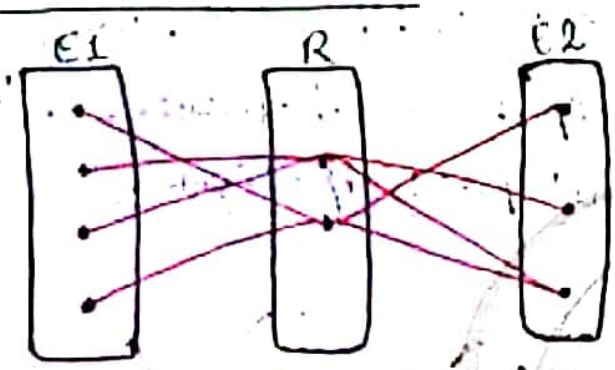
Relationship Type And Relationship Set :—



Entities Role :-

It is the function that the entity pla a relationship.

Degree in a Relationship :-



It is the no. of entity set that particip the relationship set.

Ex- R is of degree 2. [E1 & E2 are two en

Constants

Constants are restrictions imposed on tabl row level, field level e.t.c.

Relationship Constant or Mapping Constant -

- Cardinality Ratio
- Participation Constant

① Cardinality Ratio :-

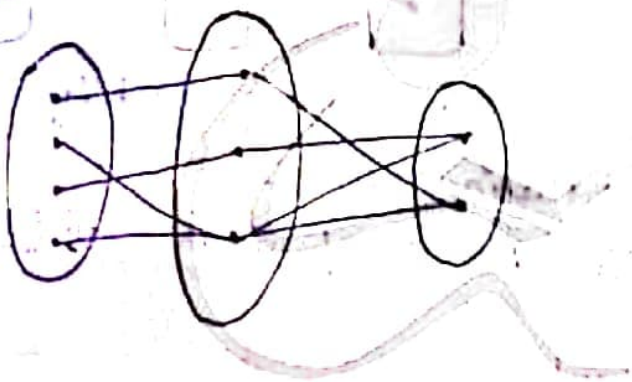
(i) 1 : 1
(ii) 1 : M (1 to Many)

② Participation Constant :-

T:P (Total participation)

Partial participation

Deletion of any of the instances from the entity set and still the relationship holds good between two or more entity set. we say there exist partial participation between entity set otherwise it is total participation.



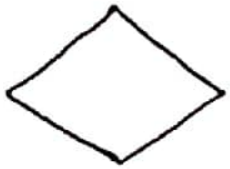
Total Participation
Means that every entity in total set of employ entity must be related to the department entity

Partial Participation
Means some or part of the set of employee entities are related to some dept. entities through managers.

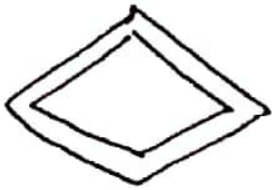
Entity Relationship Diagram (E-R diagram)

Graphical Representation	Description
	Entity
	Weak entity Set

* When an entity set doesnot contain a pr attribute is called Weak Entity Set



→ Relationship



→ Identifying Relati

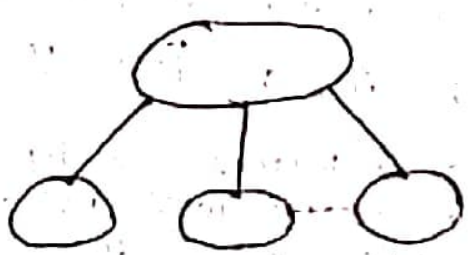
* The relationship between a strong entity and weak entity set is called identifying ship.

Example :-

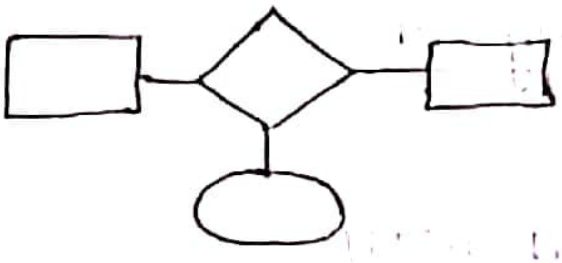
→ Attribute

→ Key Attribute

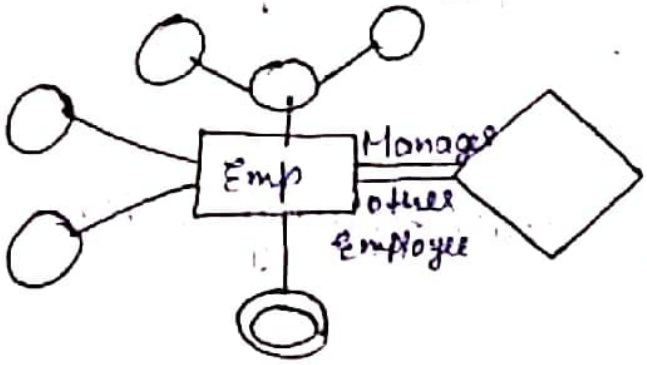
→ Multi- Value Attrib



→ Composite attribu



→ Descriptive Attri



→ Descriptive At

Q. Draw a E-R diagram for a university for the following information —

(i) Professor have a SSN, name, age & and research specialisation.

(ii) Project have project no. starting date, ending da

(iii) Graduate students have SSN, name, age & deg

(iv) Each project is managed by one professor

(v) Professor can work on multiple projects.

(vi) Each project is worked on by one or more gr student.

(vii) Dept have a Dept:no, dept name and main offi

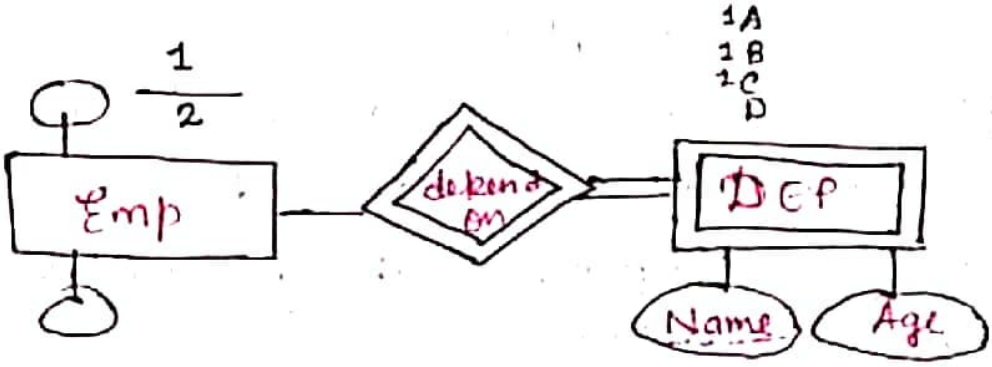
(viii) Dept have a professor who runs the depart

(ix) Professor can work in one or more departmen for each department they work in, a time % with their job.

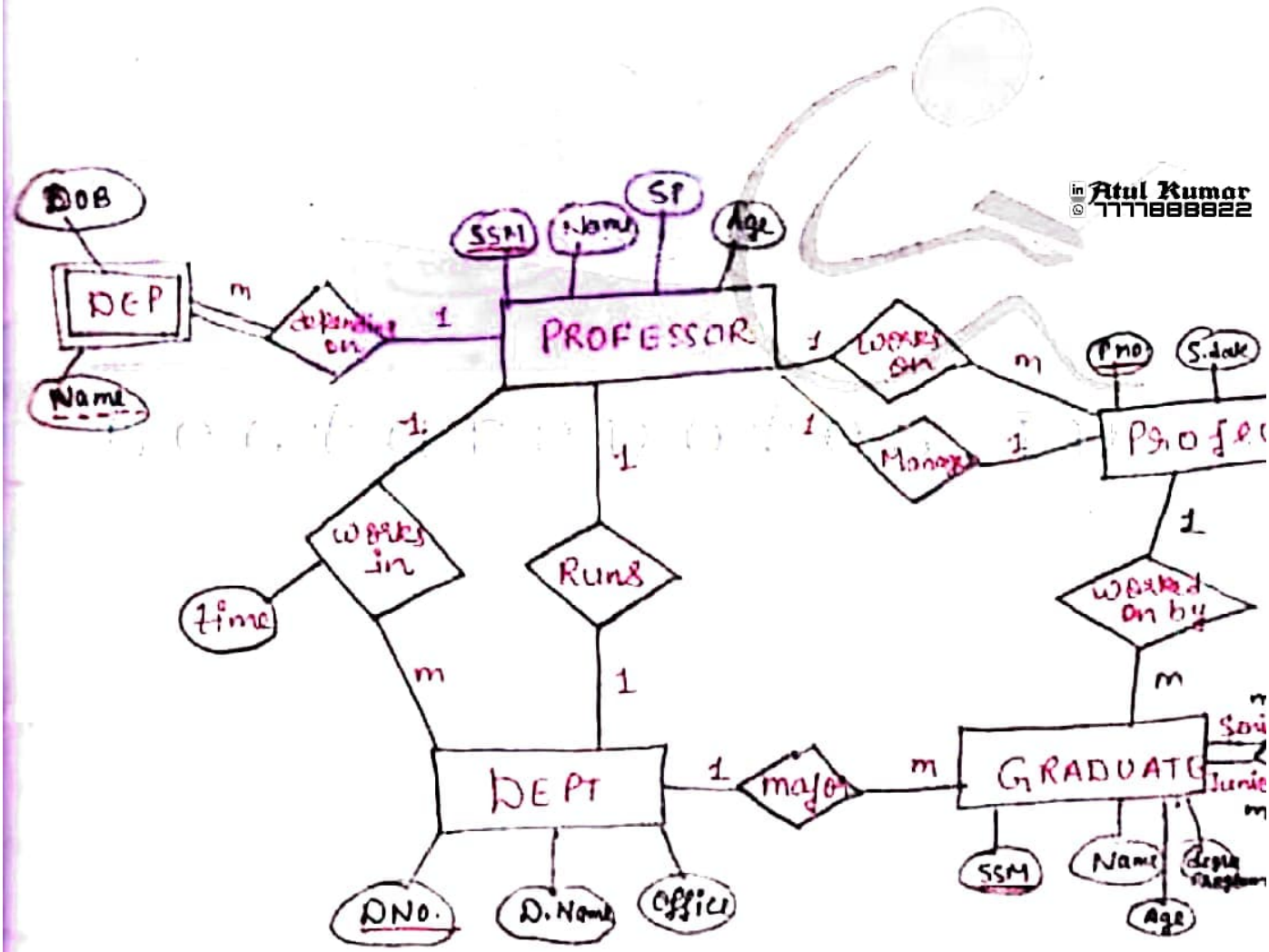
(xii) There are some persons who depen Professor for their research work, for ea we keep track of their name & DOB.

students have one major dept. in

Discriminator And Partiality



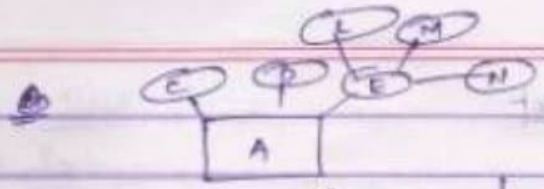
A partial key is a attribute of a set
attribute that can uniquely identify weak
which are related to some other enti



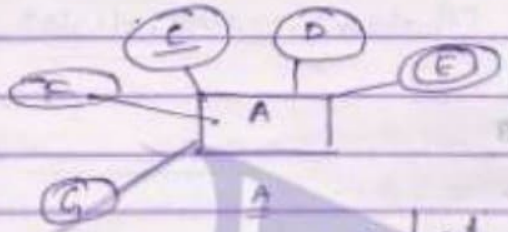
Q. Draw a E-R diagram
The company is organised into dept. which
has a name, no. & an employee who manages
we keep track of the start date of the dept. ma

working hours per week that an employee currently works on each. We also keep track of the direct supervisor of each employee.

Each employee may have a no. of dependence and each dependent has name DOB and address. Design the E-R diagram making available of all the above mention criteria.

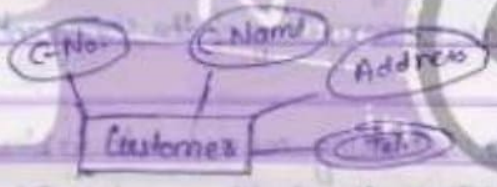


A	C	D	L	M	N



A	C	D	F	G

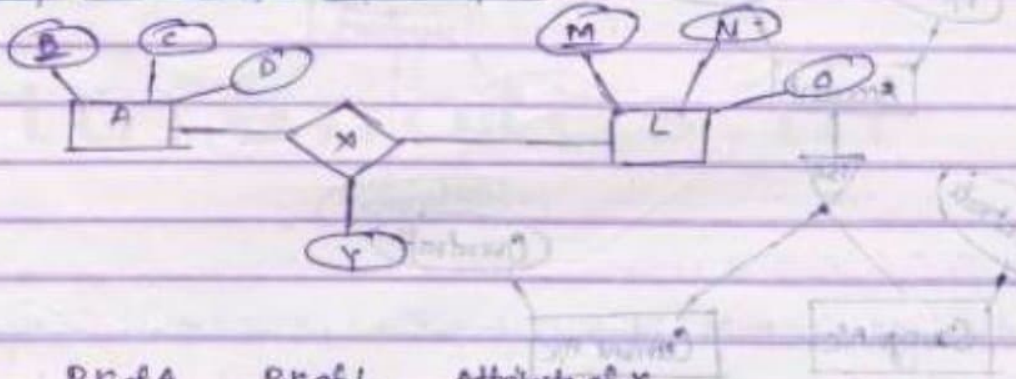
A	C	E



C-No.	C-Name	Address
1	A	X

C-No.	Rel.No.
1	7
1	9

My Tabular Representation of a Relationship set.



P.K of A	P.K of L	Attribute of X
B	M	Y

Generalisation :—

A generalisation hierarchy specifies that two or more entity that share common attribute can be generalised into a higher level entity type or a Sy super-type or generic entity, the lower-type entities are called Sub-type attribute.

→ Generalisation is a simple inversion of specialisation.

→ Move above the order is generalisation where a general base class is defined.

Constants On Generalisation & Specialisation

There are three level of constant on a E-E-R Model —

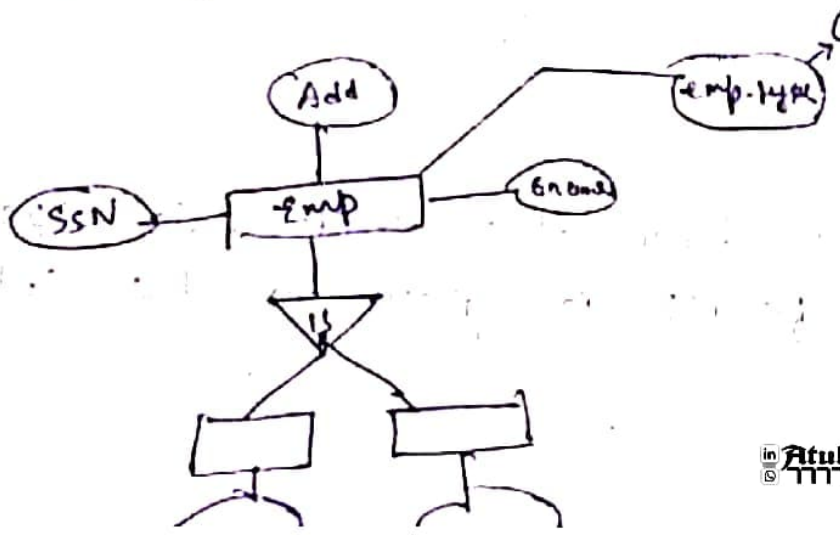
(1) Determining which entity can be member of a given lower level entity set.

a.) Condition defined &
Predicate defined.

b.) User defined

A member is chosen on the basis of whether or not and entity satisfies an explicit condition

Eg -



All lower level entities are evaluated o
of the common attribute i.e (employee type)
this type of generalisation is called attr
defined or condition defined.

b. User defined :-
Membership is specified individually for
entity by the user and not by any
condition, that may be evaluated autom

Eg- Employee $\xrightarrow{\text{worked in}}$ Marketing.

The members are assigned to one of t
selected four work teams by the organis
The four teams are represented as four l
level entity sets of the higher level en
entity set. The team group is not choos
basing on any certain condition, rather
done by the user who is incharge of t
decision making.

Type - 2 :-
(ii) It relates to whether or not entity m
belong to more than one lower level
set within a single Generalisation.

(a.) Disjoint Constraint :-
(b.) Overlapping

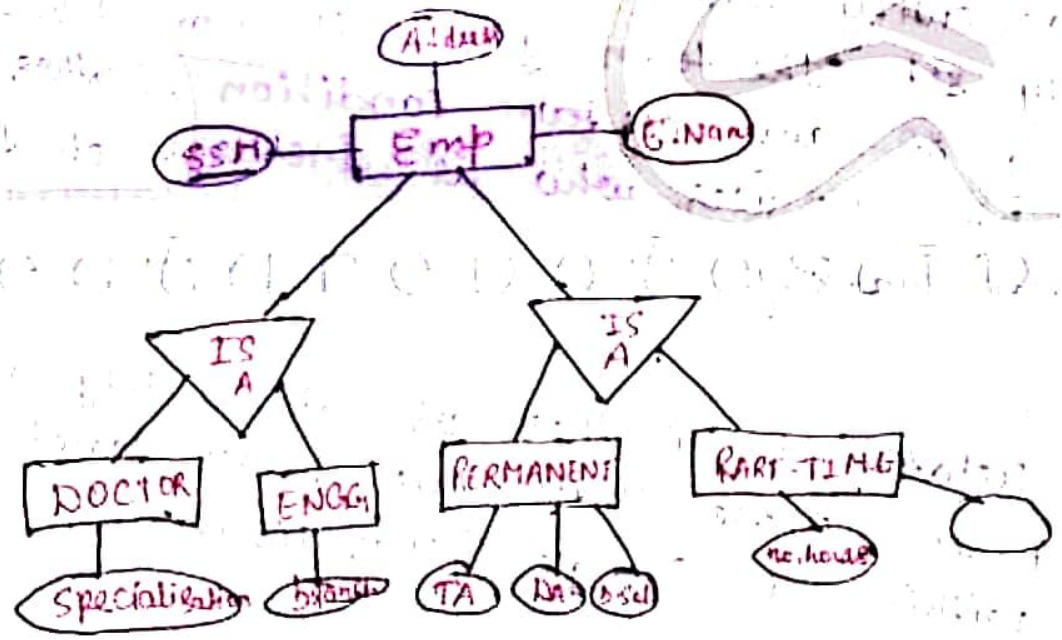
Disjoint Constraint :-

Eg- An entity can either be a part time employee or a permanent emp but cannot be both.

(b) Overlapping :— Same entity can be member of more than 1 subclasses of the specialisation.

Eg- From employee worked in certain mangers can participate in more than one worker group.

(iii) Specifies whether or not an entity in a higher level entity set must belong to atleast one of the lower level entity set e either



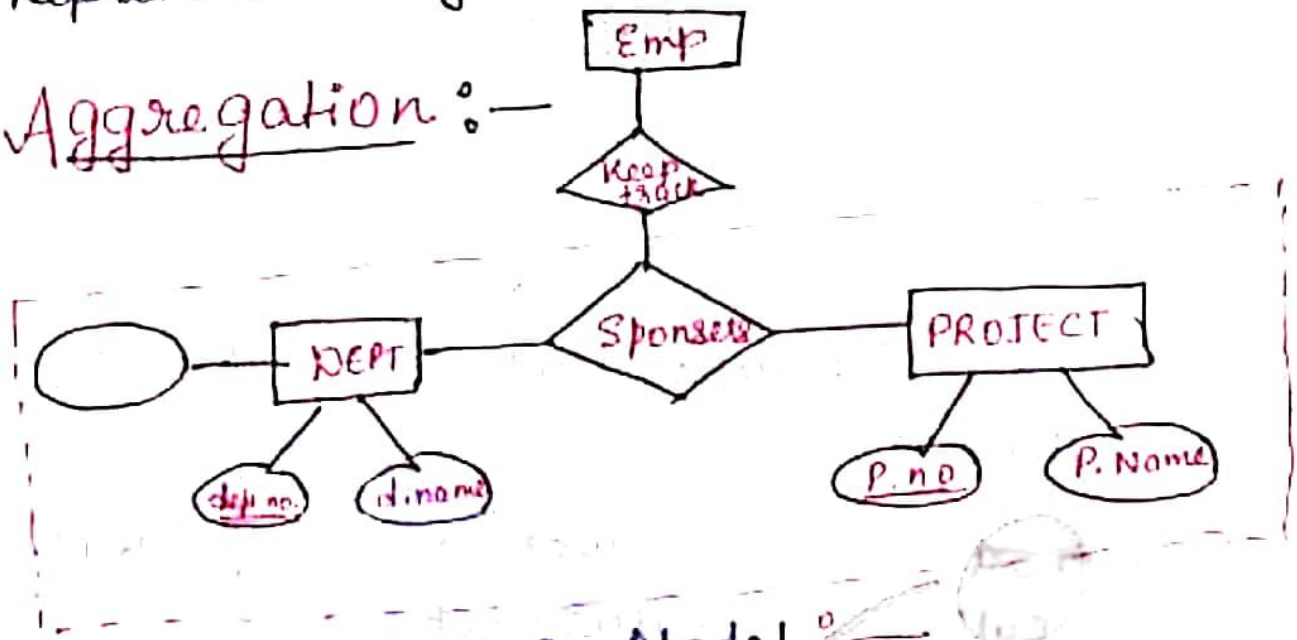
Every entity in a super-class must be a member of atleast one sub-class in the specialisation

Represented by using a double-line connection from super class to IS A.

Some Super-class entities maynot belong any subclass entities.

Represented by a single line connectivit

Aggregation :—



Limitation of E-R Model :—

One limition of E-R Model (also E.E.R) - it is not possible to express relationship relationship. we will use a new picture cal aggregation which allows us to indicate a relationship set can participate in anoth relationship set.

From the ex- Dept. that Sponers projec assign some employees to keep track of sponsers. Hence, KEEP TRACK should b relationship set that associates a spo relationship with an employee entity s