DBMS NOTES

UNIT 3 - Relational Data Model

- **Relational Database**
  - Relational database means the data is stored as well as retrieved in the form of relations (tables).
  - A database is a collection of 1 or more ‘relations’, where each relation is a table with rows and columns.
  - This is the primary data model for commercial data processing applications.
  - The major advantages of the relational model over the older data models are -
    - It is simple and elegant.
    - Simple data representation.
    - The ease with which even complex queries can be expressed.

- **A relation consists of -**
  - Relation Schema - The relation schema describes the column heads for the table. The schema specifies the relation’s name, the name of each field (column, attribute) and the ‘domain’ of each field.
  - Relation Instance - An instance of a relation is a set of ‘tuples’, also called ‘records’, in which each tuple has the same number of fields as the relation schemas.

- **Degree** - The number of fields is called ‘degree’. This is also called ‘arity’.

- **Cardinality** - The cardinality of a relation instance is the number of tuples in it.

- **Relational database schema** - It is the collection of schemas for the relations in the database.

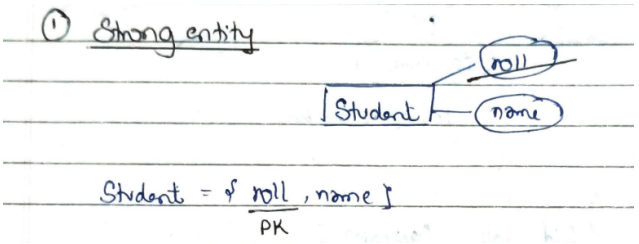
- **Instance** - An instance of a relational database is a collection of relation instances, one per relation schema in the database schema. Each relation instance must satisfy the domain constraints in its schema.

- **Key & its Types -**
  - Key is a set of one or more attributes that describes an entity uniquely.
  - Types -
    - Super Key - The set of attributes that can uniquely identify a tuple is known as Super Key. For Example, STUD_NO, (STUD_NO, STUD_NAME), etc.
    - Candidate Key - The minimal set of attributes that can uniquely identify a tuple is known as a candidate key. For Example, STUD_NO in STUDENT relation. It is a minimal super key.
    - Primary Key - There can be more than one candidate key in relation out of which one can be chosen as the primary key. For Example, STUD_NO.
    - Alternate Key - The candidate key other than the primary key is called an alternate key. For Example, STUD_NO, as well as STUD_PHONE both, are candidate keys for relation STUDENT but STUD_PHONE will be an alternate key (only one out of many candidate keys). It is also called a surrogate key.

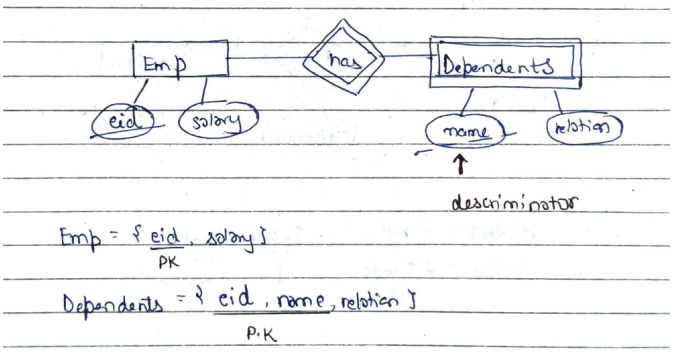
        - Foreign Key - If an attribute can only take the values which are present as values of some other attribute, it will be a foreign key to the attribute to which it refers. Primary key in one table that is being referred to in another table called foreigh key. Mainly it is used to establish a relationship between tables.

- **Constraints Types -**
    - Model based / Implicit Constraints -
        - ER - Can't represent cardinality in a recursive relationship.
        - Relational Model -
            - Can't have duplicates.
            - Have atomic values.
    - Schema based / Explicit Constraints -
        - Domain Constraints -
            - Every domain must contain atomic values(smallest indivisible units) ; composite and multi-valued attributes are not allowed.
            - We perform data type check here, which means when we assign a data type to a column we limit the values that it can contain.
        - Integrity Constraints -
            - An integrity constraint (IC) is a condition that is specified on a database schema and restricts the data that can be stored in an instance of the database.
            - Entity Integrity constraints says that no primary key can take NULL value, since using primary key we identify each tuple uniquely in a relation.
        - Key Constraints -
            - These are called uniqueness constraints since it ensures that every tuple in the relation should be unique.
            - A relation can have multiple keys or candidate keys(minimal superkey), out of which we choose one of the keys as primary key, we don't have any restriction on choosing the primary key out of candidate keys, but it is suggested to go with the candidate key with less number of attributes.
            - Null values are not allowed in the primary key, hence Not Null constraint is also a part of key constraint.
        - Referential Integrity Constraints -
            - It is specified between 2 relations and is used to maintain the consistency among tuples of the 2 relations.
            - Informally, the referential integrity constraint states that 'a tuple in 1 relation that refers to another relation must refer to an existing tuple in that relation.
        - Candidate Key - A set of attributes called a candidate key if they satisfy the following properties.
            - Uniqueness - Two types in any relation can not have identical values for all attributes.
            - Minimality - No proper subset of the key should satisfy uniqueness property.
            - Referential Integrity - This constraint states that if there is a foreigh key in one relation then each foreigh key value must match the primary key in another table (or the foreigh key value can be null.

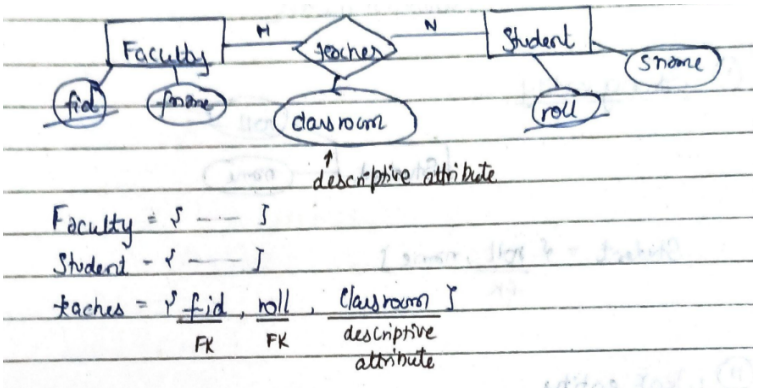
- **Conversion of ER model to Relational Model -**
  - Strong Entity -



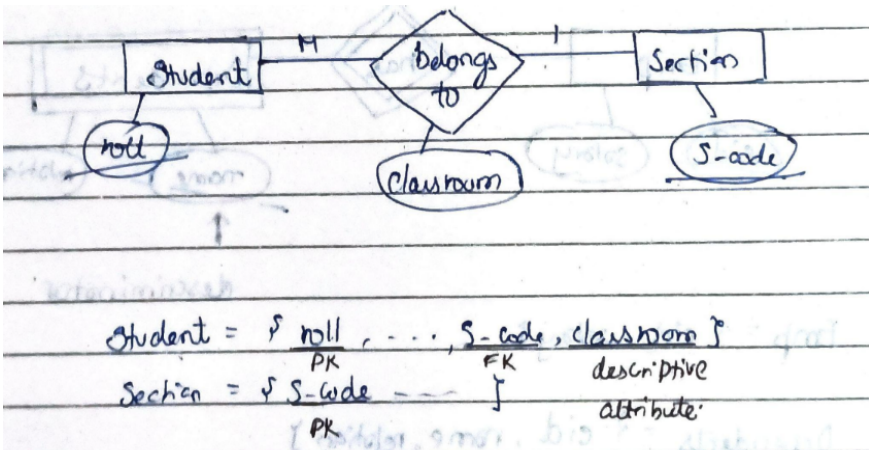
  - Weak Entity -



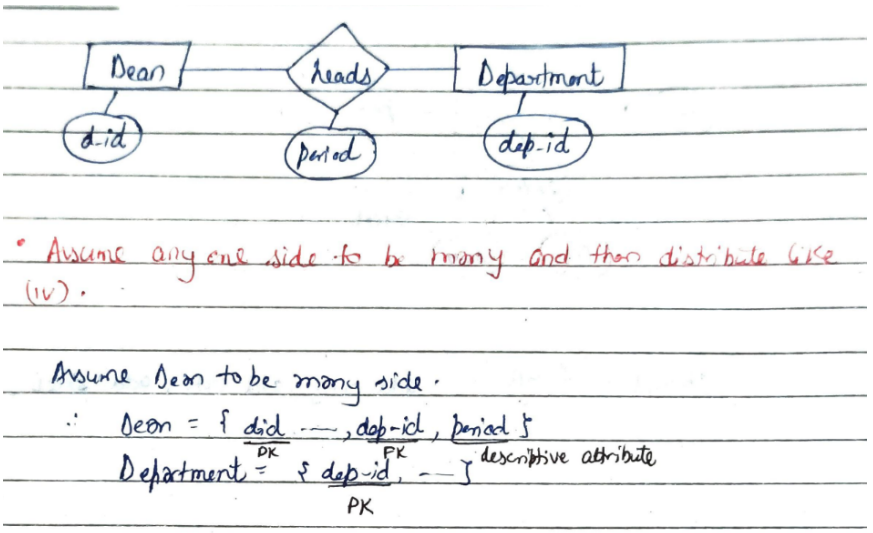
  - M:N relationship -



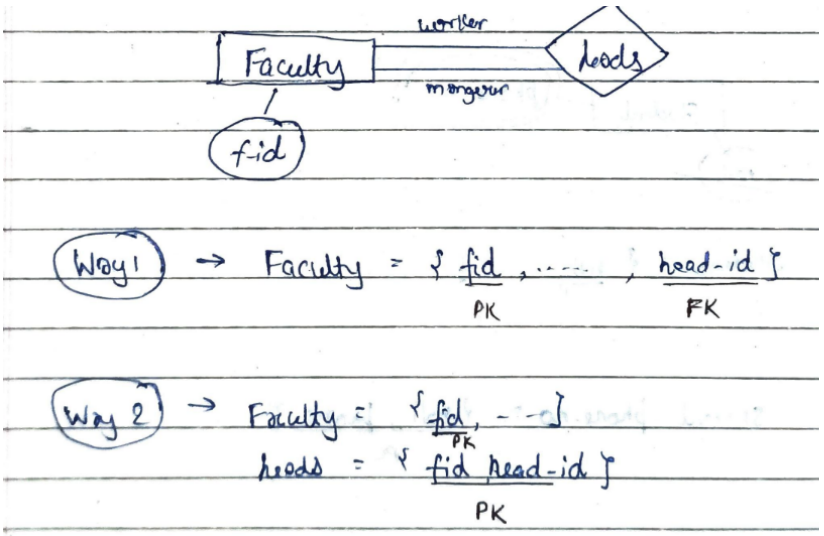
  - 1:M relationship -



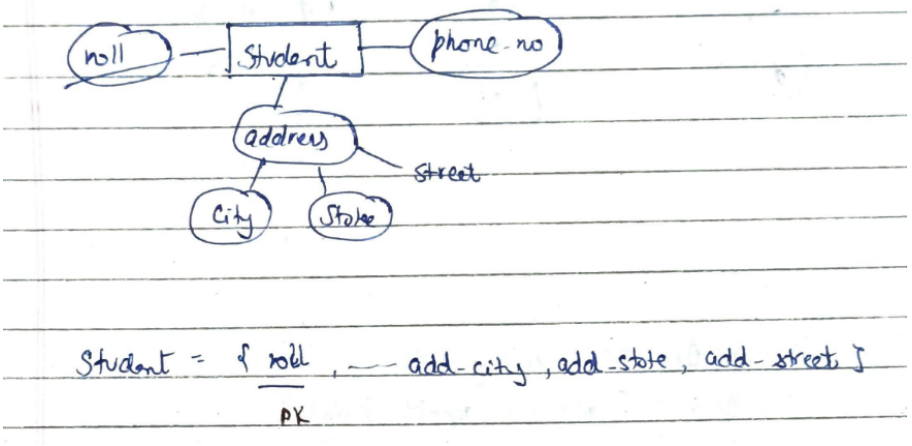
- 1:1 relationship -



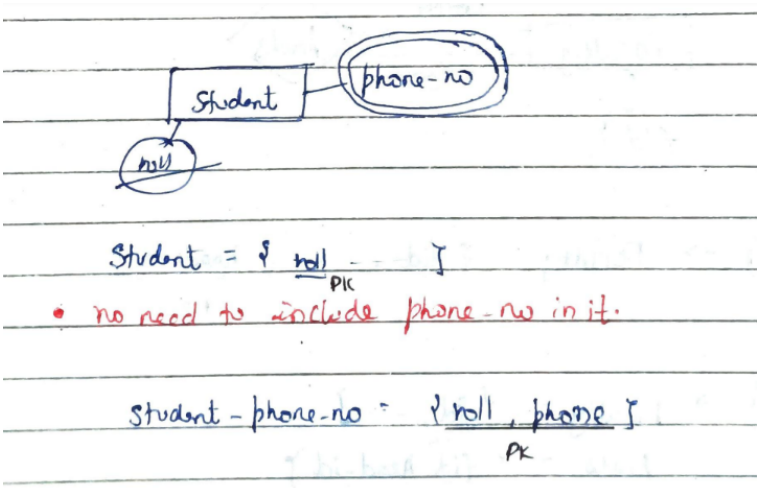
- Recursive relationship -



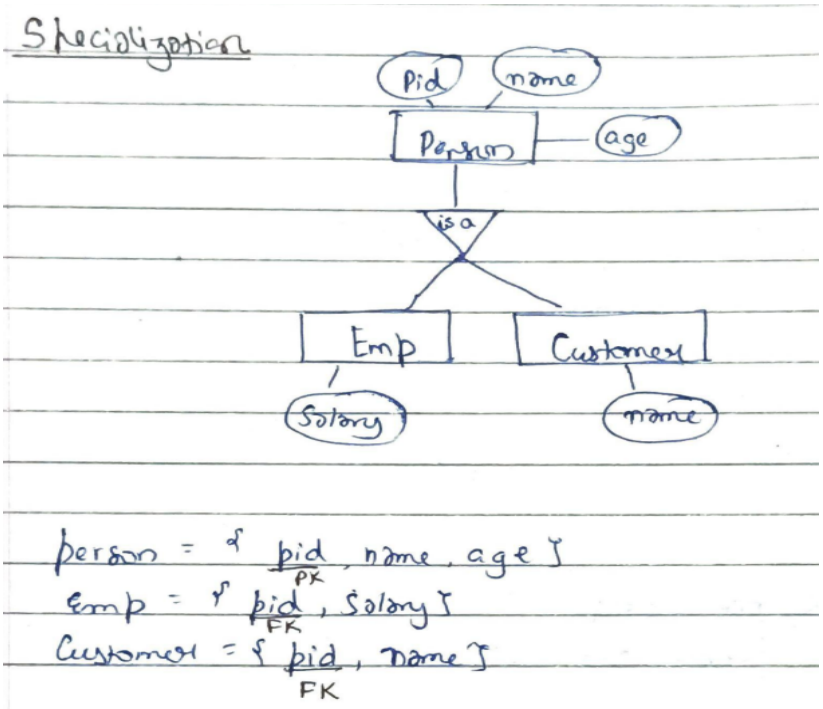
- Composite Attributes -



- Multivalued attributes -



- Specialisation -



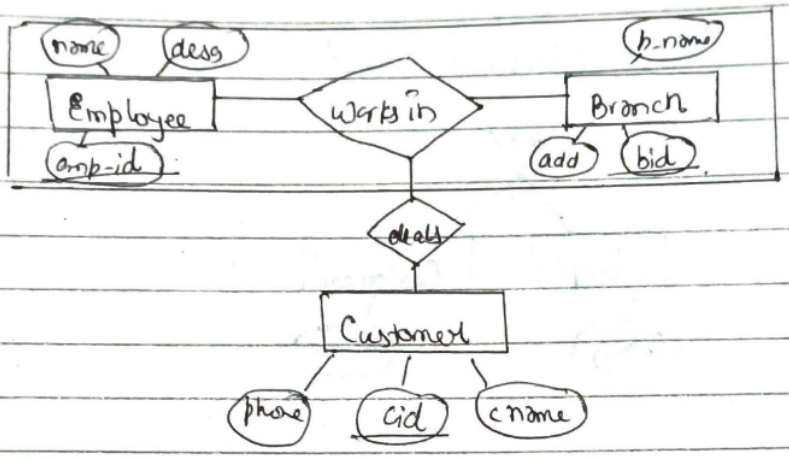
☆ If specialization is

(1) disjoint then table for super class is not required.
So it will be like —

Emp = { p_id, name, age, salary }

Customer = { p_id, name, age, name }

- Aggregation -



Emp = { emp-id, name, desg - - }
PK

Branch = { bid, b_name, add - - }
PK

Customer = { cid, cname, phone }
PK

Works in = { emp-id, bid }
PK

deals = { emp-id, bid, cid }
PK