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Unit - II (Database design and E-R model)

Entity

- Entity is a real-world object or concept that can have data stored in it.
- Entities typically correspond to physical or logical things such as person, place, event or object.

characterstics

↳ Uniqueness
Each entities can be identifiable

↳ Attributes
Entities have characteristics called attributes.

↳ Entity set
A collection of similar entity is called entity set.

Types

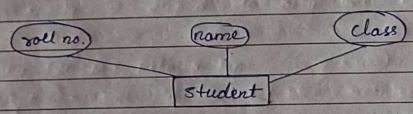
① Strong entity
Can exist independently and has a primary key.

② Weak Entity
Depends on another entity and has no sufficient attributes to form primary key.

Attributes

- Attributes are property or characteristic of an entity. attributes are used to describe the entity.
- The attribute is nothing but a piece of data that give more information about the entity. Attributes are used to distinguish one entity from other entity.

Ex:-



- As shown in figure, roll no., name and class are attributes of entity student.

Types of attributes

① Simple attribute
Simple attribute are those attribute that cannot be divided into more attribute

② Composite attribute
when 2 or more than 2 simple attribute are combined to make an attribute then attribute is called composite attribute.

③ Single valued attribute
The attribute with only a single value is known as single valued attribute.

④ Multivalued attribute
An attribute which can have multiple values is known as multilevel attribute.

⑤ Key attribute
The attribute which has unique values for every row in table is known as key attribute.

⑥ Derived attribute
The attribute which can be derived from another attribute is called derived attribute.

⑦ Stored attribute
If data of attribute remains constant then it is called stored attribute.

⑧ Complex attribute
when multi-valued and composite attribute together form an attribute then it is called a complex attribute.

Relationship

- A relationship in DBMS is the way in which two or more data set are linked.
- Any association between two entity type is called relationship.

Types

① One - to - One (1:1) Relationship
Each record in one table is associated with only one record in another table.

② One - to - Many (1-M) Relationship
One entity is related to multiple entities, but each of those entity is linked to only one entity.

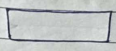
③ Many - to - Many (M:M) Relationship
Multiple records in one tables relates to multiple records in another.

ER Model

- ER model stands for Entity - Relationship model. it is a conceptual model for designing a database.
- This model represent the logical structure of database including entities, their attributes and relationship between them.

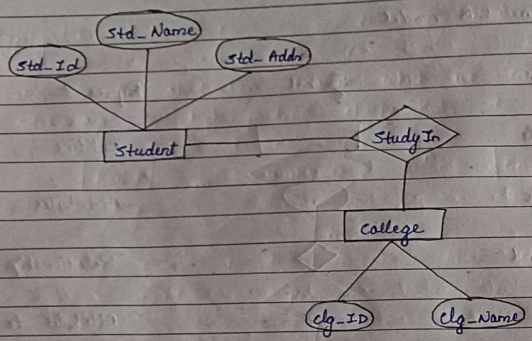
Components - Entities
Attributes
Relationship

Symbol used in ER model

figures	Symbol	Represent
Rectangle		Entities
Ellipse		Attributes
Diamond		Relationship
Line		Attributes to entities
Double ellipse		Multi - valued attributes
Double Rectangle		Weak entity

How to draw an ER diagram

1) Identify entities
2) Identify Relationship
3) Identify Attributes
4) Define primary key
5) Remove redundancies
6) Review for clarity



Ex- E-R diagram

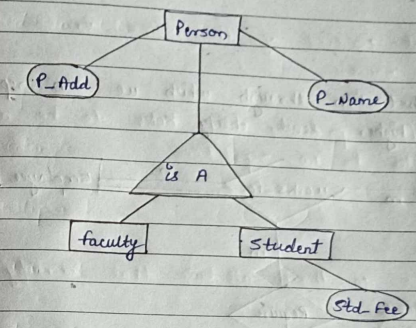
Extended ER features

1) Generalization

Generalization is the process of extracting common properties from a set of entities and creating a generalized entity from it.

- It is a bottom up approach in which two or more entities can be generalized to a higher - level entity if they have same attribute in common.
- Generalization is also called "Bottom up approach"

Ex-

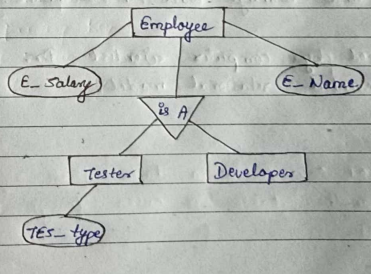


2) Specialization

In specialization, an entity is divided into sub-entities based on its characteristics.

- It is a top-down approach where the higher-level entity is specialized into two or more lower level entities.
- Specialization is also called as "Top-down approach"

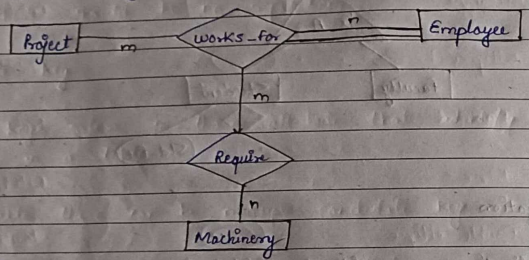
Ex-



3) Aggregation

Aggregation is an abstraction through which we can represent relationship as higher - level entity set.

Ex :-



Cord's Rule

Cord's rule is a set of principal that define characteristics of true relational database management system.

- It's a collection of 12 rule which help us to design perfect database and manage data in database.
- This rule is proposed by computer scientist Dr. Edger F. Codd and also he invented relational model.

12 Rule :-

1) Information rules
2) The guaranteed access rule
3) Systematic treatment of null value
4) Active online catlog rule
5) The comprehensive data sublanguage rule
6) The view updating rule
7) High level update, insert, delete rule
8) Physical data independence rule
9) Logical data independence rule
10) Intigrity independence rule
11) Distribution independence
12) Non - subversion rule

Concept of Keys

Keys are one of the basic requirement of relational database model.

- Keys are fundamental component that ensure data integrity, uniqueness and efficient access.

Types :-

1) Primary Key

Primary Keys refers to a column or a set of column of a table that help us identify all records uniquely present in the table.

- Primary key cannot consist of the same values repeating for any of its rows
- All the values of a primary key have to be different, and there should be no repetition.

2) Candidate key

- Candidate keys refers to those attribute that identify rows uniquely in a table
- In a table there can be multiple candidate key.
- Candidate key has similar properties as that of primary key.

3) Alternate key

- All those keys that did not become a primary key are known as alternate key.
- A candidate key that is not choosen as primary key.
- Null values not accepted.

4) foreign key

- A column or set of column in a table that refers to the primary key of another table is called foreign key.
- It help establish relationship between tables.

5) Super Key

- A set of one or more column that can uniquely identify records in a table.
- Every primary key is a super key, but not every super key is a primary key.

6) Unique Key

- A unique key refers to a column or a set of columns that identify every record uniquely in a table.
- Unique key can have null value whereas primary key cannot have a null value.

7) Composite key

- Composite key is a candidate key that consist of two or more attribute that uniquely identified.
- It act as a primary key when there is no primary key in a table.