



ER MODEL

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ITER,S'O'A(DEEMED TO BE UNIVERSITY)

Feb 2024

Review

■ The ER Model

Content

- The ER Model
- The ER Diagram

Entity-Relationship (ER) Data Model

- The ER data model facilitates database design by allowing specification of an **enterprise schema** that represents the **overall logical structure** of a database.
- It is very useful in mapping the **meanings** and **interactions** of real-world enterprises onto a **conceptual schema**.
- The ER data model employs three basic concepts:
 - Entity Sets,
 - Relationship Sets,
 - Attributes.
- The ER model also has an associated diagrammatic representation, the **ER diagram**, which can express the overall logical structure of a database graphically.

ER Data Model - II

- This data model uses a collection of
 - basic objects, called *entities*,
 - and *relationships* among these objects.
- An entity is a “thing” or “object” in the real world that is distinguishable from other objects.
 - Ex: *employee, student, account*
- An entity has a set of properties that uniquely identifies an entity called *attributes*.
 - Ex: Employee (*emp_no, emp_name, ...*)
 - Student (*stu_no, stu_name, branch, ...*)

ER Model: Entity Set

- **Entity Set** : is a set of entities of the same type that share the **same attributes**.
 - **Ex:** The set of all people who are instructors at a given university, can be defined as the entity set **instructor**.

76766	Crick
45565	Katz
10101	Srinivasan
98345	Kim
76543	Singh
22222	Einstein

instructor

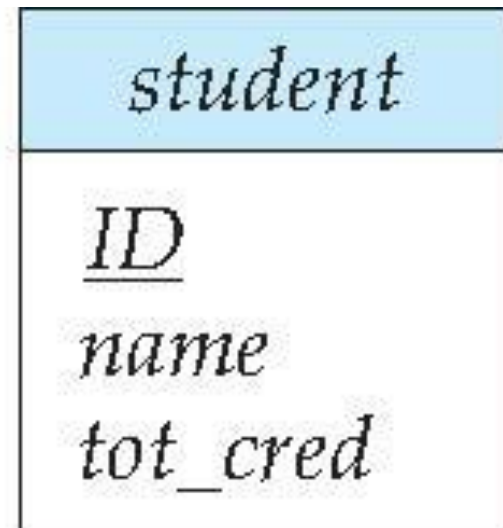
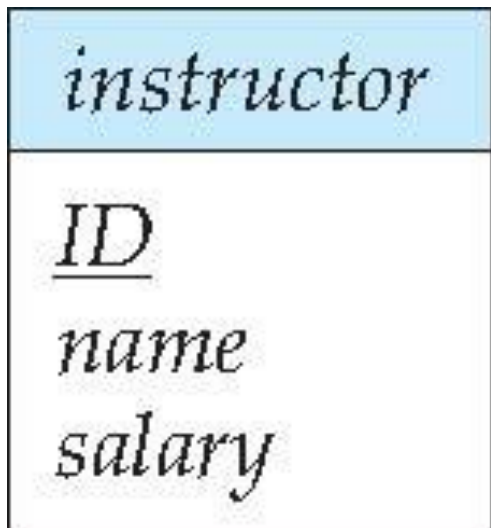
98988	Tanaka
12345	Shankar
00128	Zhang
76543	Brown
76653	Aoi
23121	Chavez
44553	Peltier

student

- **Ex:** The set of all students at a given university, can be defined as the entity set **student**.

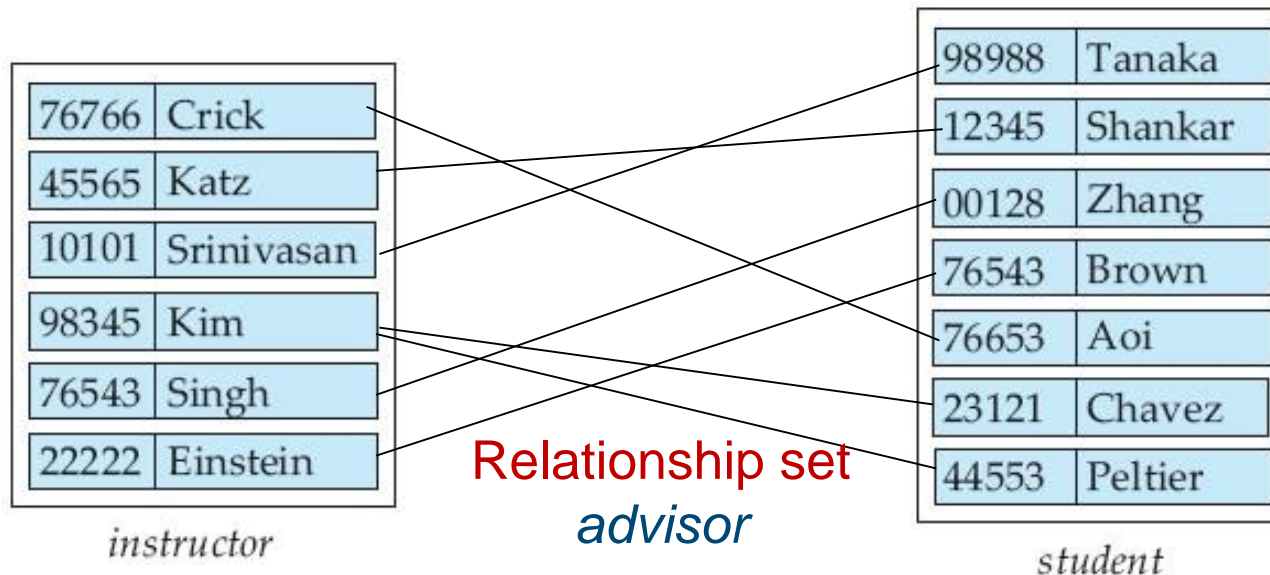
ER Diagram: Entity Set

- Entities are represented graphically as follows:
 - Rectangles represent entity sets.
 - ▶ Part I: entity set name
 - ▶ Part II: Attributes listed inside entity rectangle
 - Underline indicates primary key attributes



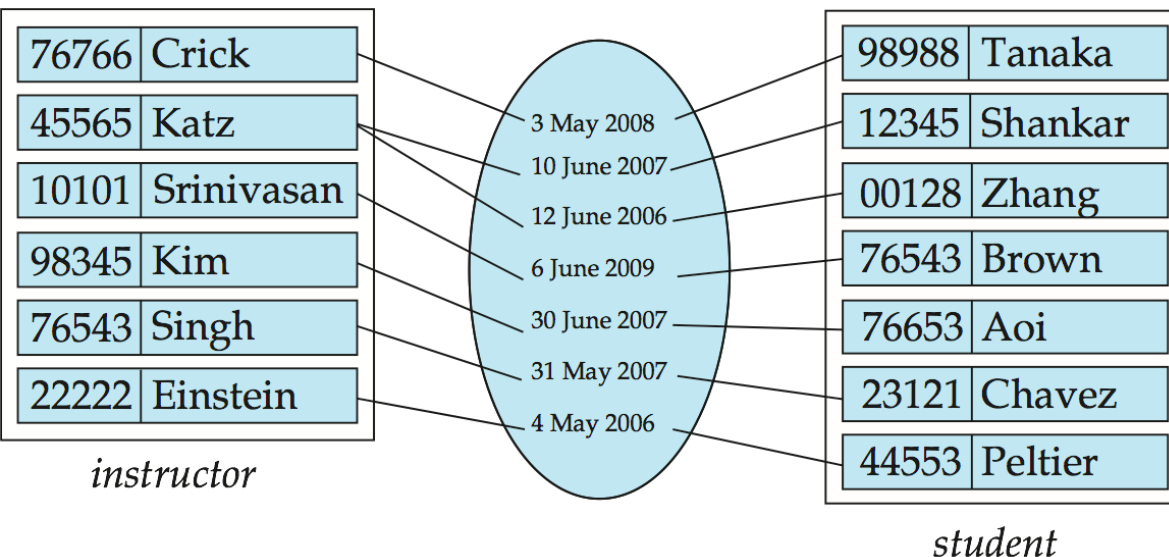
ER Model: Relationship - I

- **Relationship**: A relationship is an *association* among several entities.
 - **Ex**: Let's define a relationship *advisor* that *associates* instructor Katz with student Shankar.
- **Relationship set**: is a set of relationships of same type between two or more entity sets.



ER Model: Relationship Set - II

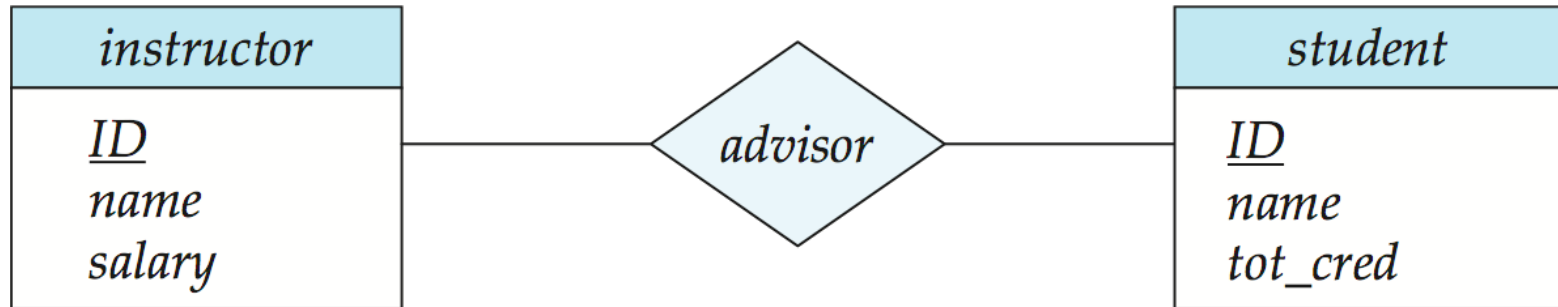
- The association between entity sets is referred to as *participation*.
 - Ex: Katz and Shankar **participate** in **relationship instance** of **advisor**
 - i.e. This relationship instance represents that in the university, instructor Katz is advising student Shankar.
- Relationship may also have attributes called *descriptive attributes*.



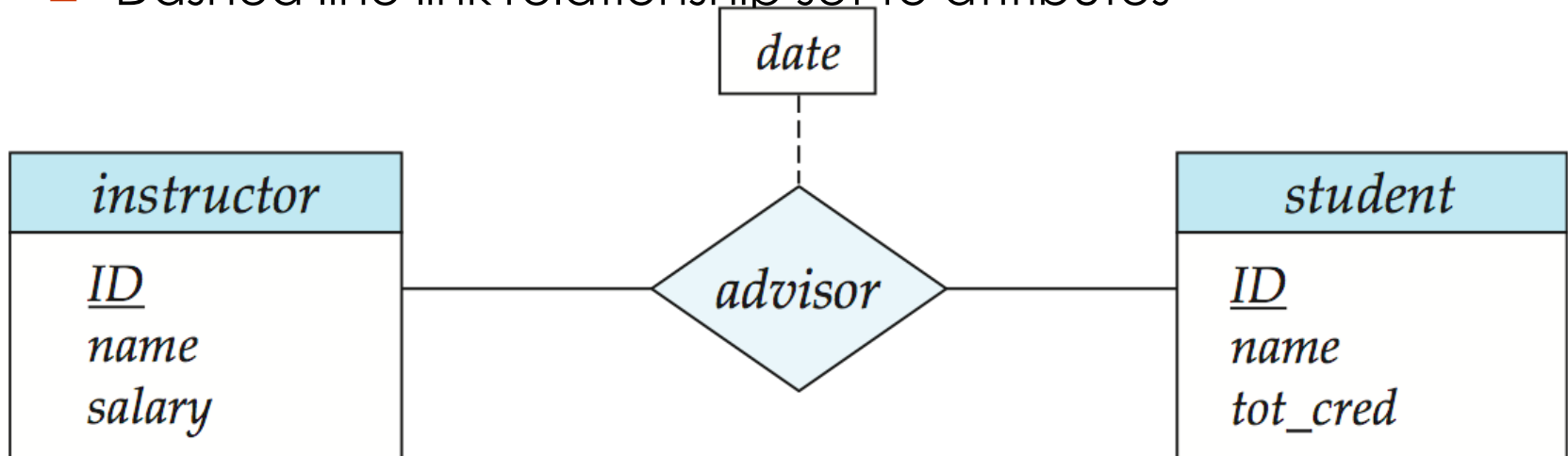
Ex. the **advisor** relationship set between entity sets **instructor** and **student** have the attribute **date** which tracks when the student started being associated with the advisor

ER Diagram: Relationship sets

- Diamonds represent relationship sets
 - Solid lines link entity set to relationship sets



- Relationship sets with attributes
 - Undivided rectangles represent attributes of relationship set
 - Dashed line link relationship set to attributes



Project-I - Step I

- Entity set **Customer** with attributes
 - cust_num, Name , Address, Phone_num
- Entity set **Account** with attributes
 - Acc_num, balance
- Entity set **Loan** with attributes
 - loan_num, Loan_amt
- Entity set **Branch** with attributes
 - branch_id, branch_name, branch_address
- Relationship set **Deposits** between Customer & Account
- Relationship set **Borrows** between Customer & Loan
- Relationship set **Loan_branch** between Loan & Branch
- Relationship set **Account_with** between Account & Branch

ER Model: Relationship Set - III

- The function that an entity plays in a relationship is called that entity's *role*
 - Katz's *role* is 'instructor', Shankar's is 'student' in the relationship of 'advisor'
- The same entity set participates in a relationship set more than once, in different roles is called *recursive relationship set*
- Also known as *unary* relationship

MTH 1001: Calculus I
MTH 2001: Calculus II
CSE1002: Discrete Maths
CSE2011: COA
MTH2002: Probability & Statistics

prerequisite

recursive relationship set

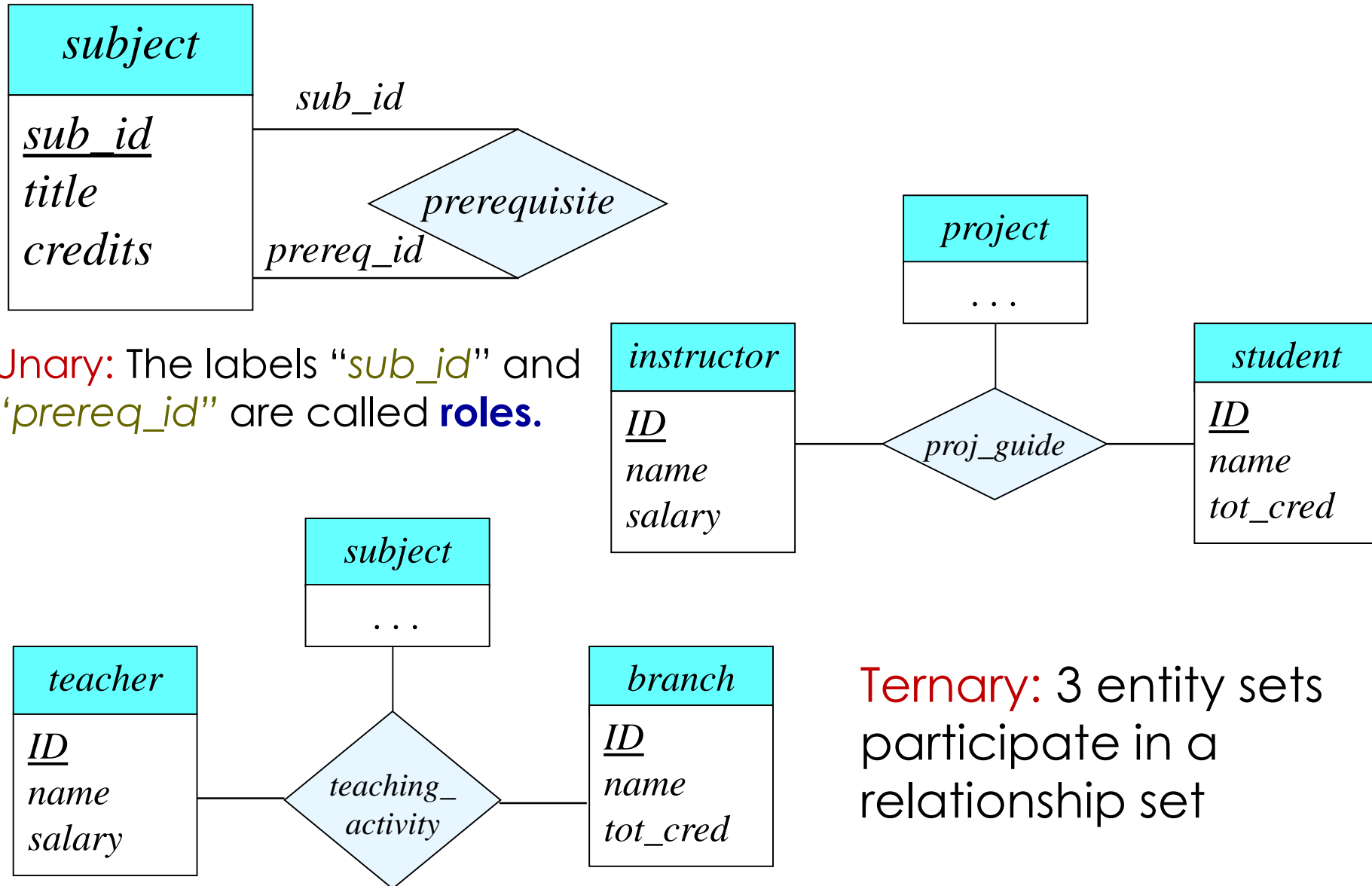
Role of MTH2001: course

*Role of MTH1001: prerequisite
course*

ER Model: Degree of Relationship

- The *degree* of a relationship set is the number of entity sets participate in the relationship.
- The three most common relationship sets categorised according to the degree in ER models are
 - *Binary*: When two entity sets participates.
 - Ex: *Teacher teaches* some *Students*
 - *Unary*: when both participants are the same entity
 - Ex: *Subject prerequisite* of another *Subject*
 - Also known as *recursive relation*
 - *Ternary*: when three entities participate in the relationship.
 - Ex1: *Instructor* becomes *project_guide* to *students* and develops *projects*
 - Ex2: *Teacher teaching_activity* with *Branch* and *Subject*

ER Diagram: Degree of Relationship



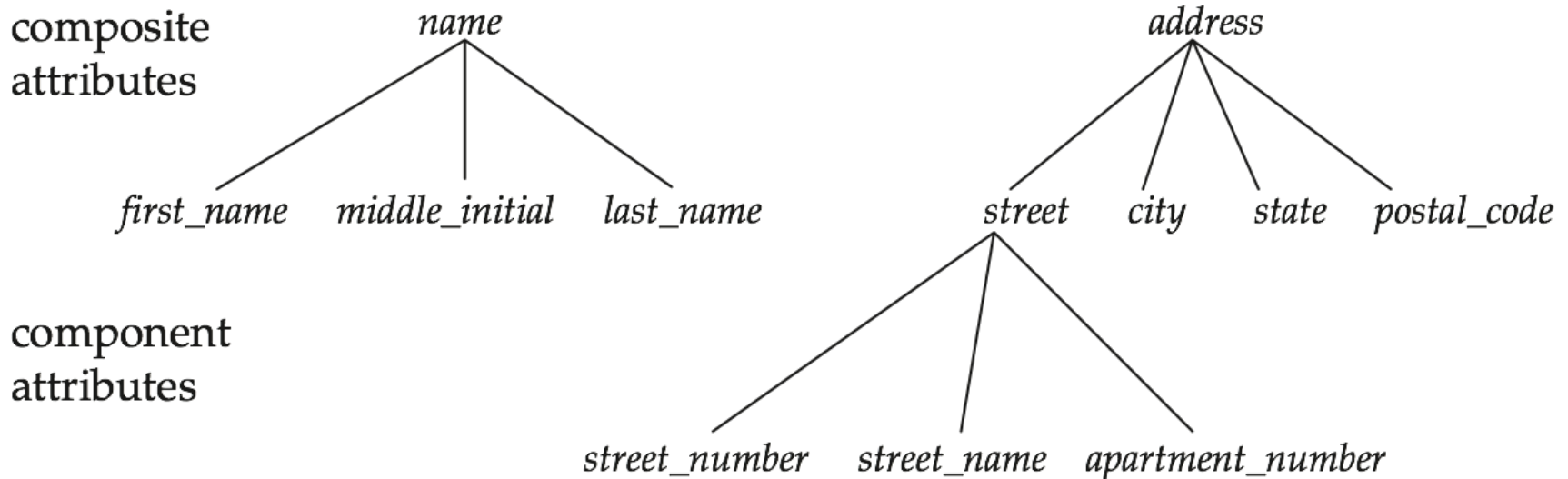
ER Model: Attributes

- Attributes are the properties of an entity set that are relevant to the database and about which the data values need to be stored.
- For each attribute, there is a set of permitted values, called **domain** or **value set**
- An attribute of an entity set is a function that maps from the entity set in to a domain.
- Each entity can be described by a set of (attribute, value) pair.
 - Ex. A particular instructor entity may be represented as $\{(ID, 76766), (name, Crick), (dept, CSIT), (salary, 50000)\}$
 - Similarly a particular student entity $\{(ID, 34721), (name, Sid), (DoB, 30-12-1997), (branch, CSIT)\}$

ER Model: Category of Attributes- I

■ Simple and Composite

- Simple attributes are atomic and cannot be divided further.
- Ex. (regNo)
- Composite attributes are sub-divided further.
- Ex. (name{first_name, middle_name, last_name})
- Composite attributes may be represented in a hierarchy.



Composite attributes are useful when it is needed to use either whole or part of the information of an attribute

ER Model: Category of Attributes- II

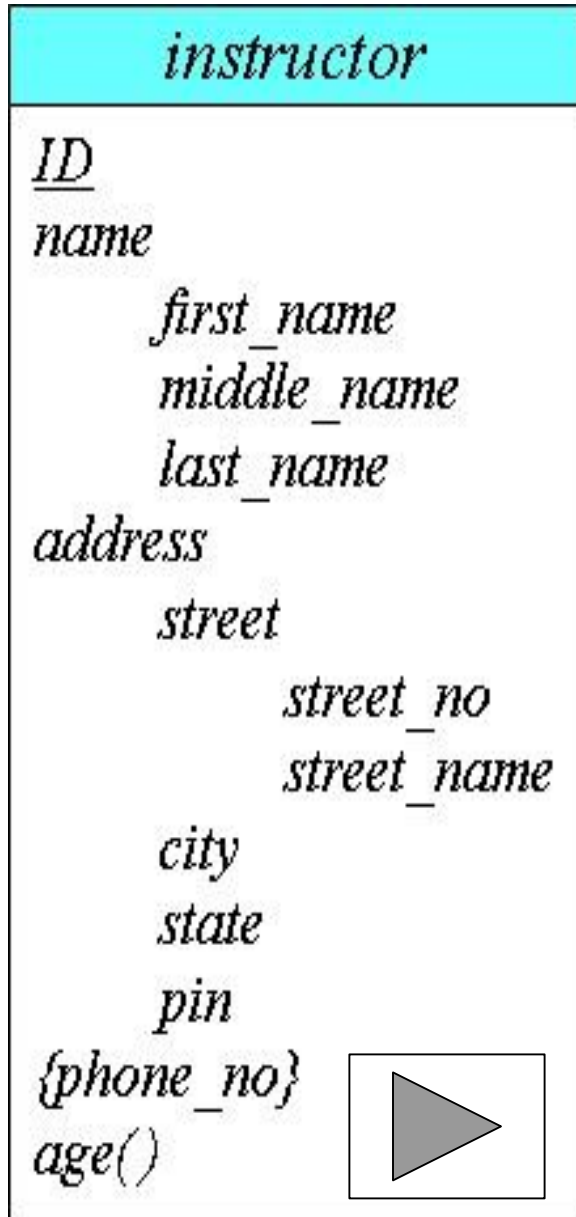
■ Single Valued and Multivalued

- Attribute that maps to only one value in a domain are called single valued attribute
- Ex. DoB, reg_no
- Attribute that maps to more than one values in a domain are called multivalued attribute.
- Ex. phone_no, email_id

■ Derived

- If the value for an attribute can be computed from the values of other related attributes then is called derived attribute
- Ex. age, net_salary, can be calculated from DoB and other salary components respectively.

ER Diagram: Attributes



- **Composite attribute**: represented in indentation.
- Ex. *name* with component attributes *first_name*, ..., *last_name*
- Ex. *address* with , *city*, *state*, and *zip*.
- Ex. *street* with *street_no*, *street name* and *apt_number*
- **Multivalued attribute**: represented using curly braces.
- Ex. *{phone_number}* of *instructor*
- **Derived attribute**: represented using parenthesis. Ex. *age()*

Thank You