UNIT 1

Lecture 7

E R Model

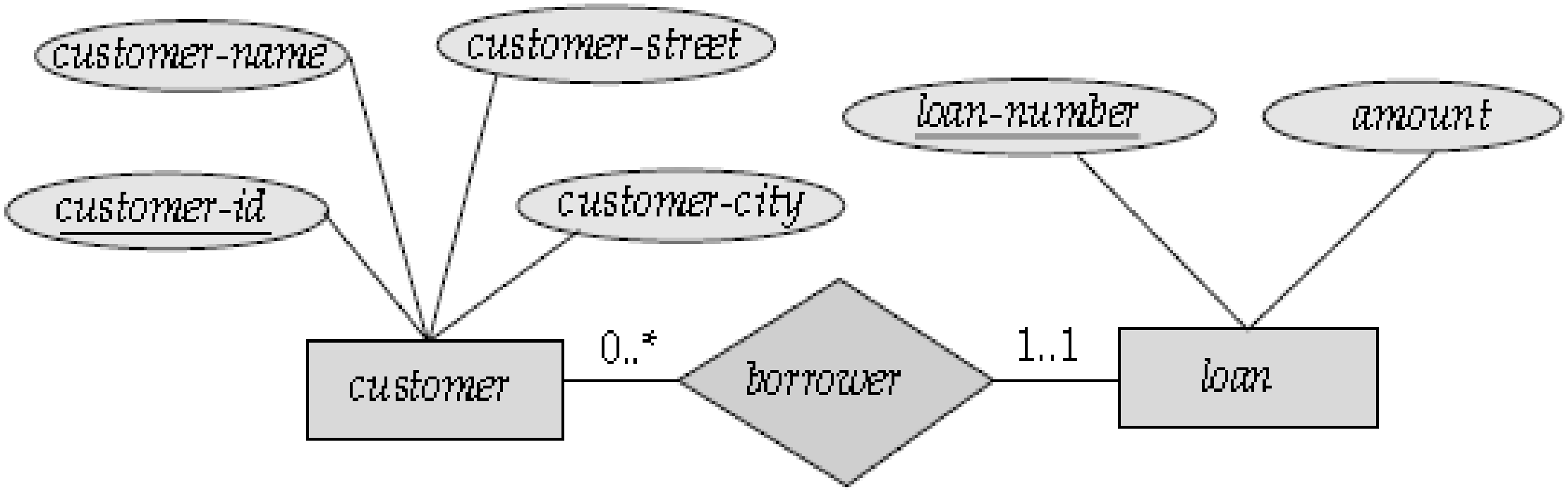
ER diagram with cardinality limits

- E-R diagrams also provide a way to indicate more complex constraints on the number of times each entity participates in relationships in a relationship set.
- An edge between an entity set and a binary relationship set can have an associated minimum and maximum cardinality, shown in the form **m..n**, where m is the minimum and n the maximum cardinality.

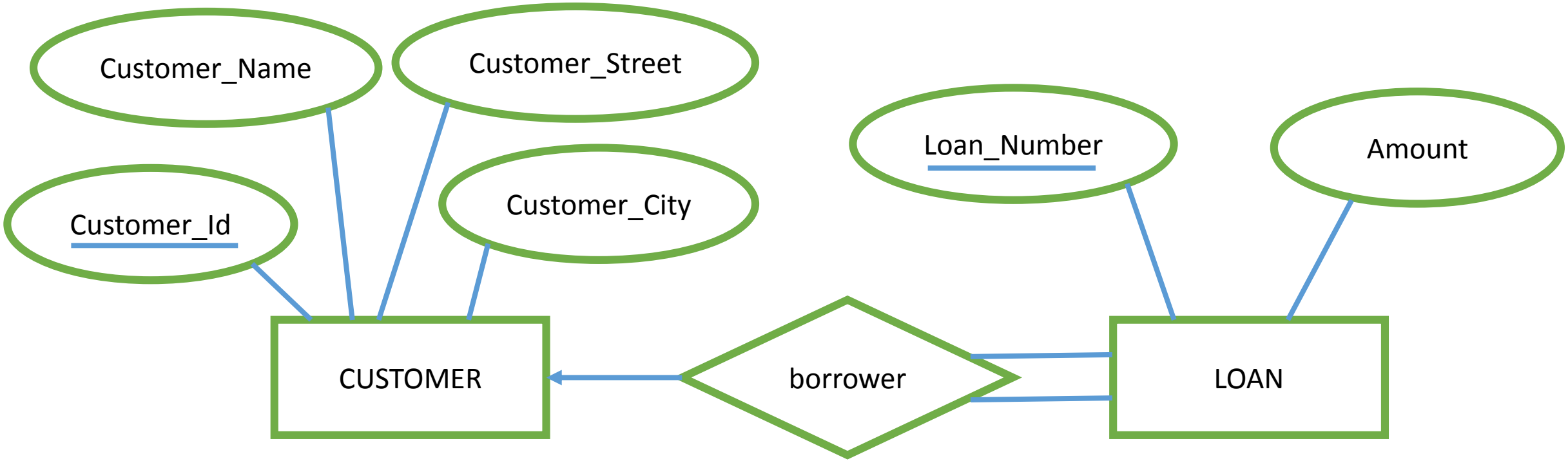
ER diagram with cardinality limits

- A minimum value of 0 indicates partial participation of the entity set in the relationship set.
- A minimum value of m indicates total participation of the entity set in the relationship set.
- A maximum value of m indicates that the entity participates in at most one relationship, while a maximum value * indicates no limit.
- Note that a label **m..*** on an edge is equivalent to a double line.

ER diagram with cardinality limits



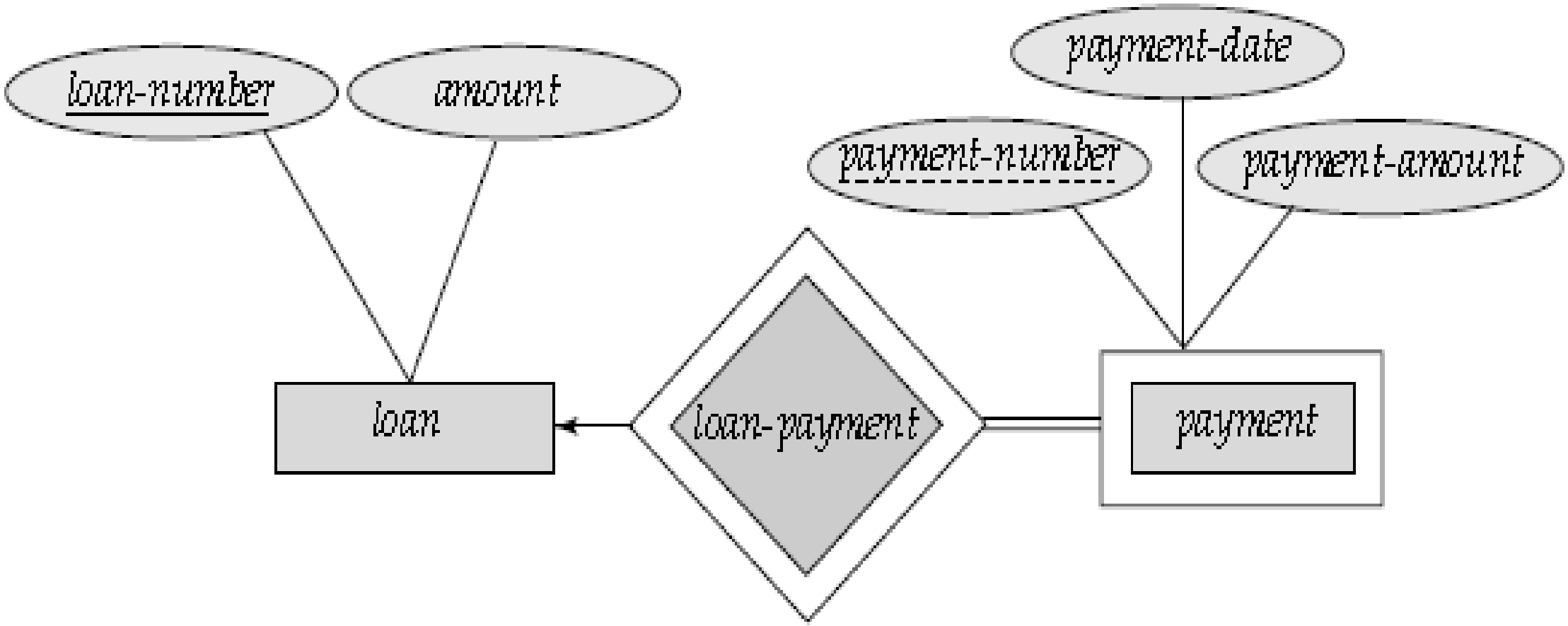
ER diagram with cardinality limits



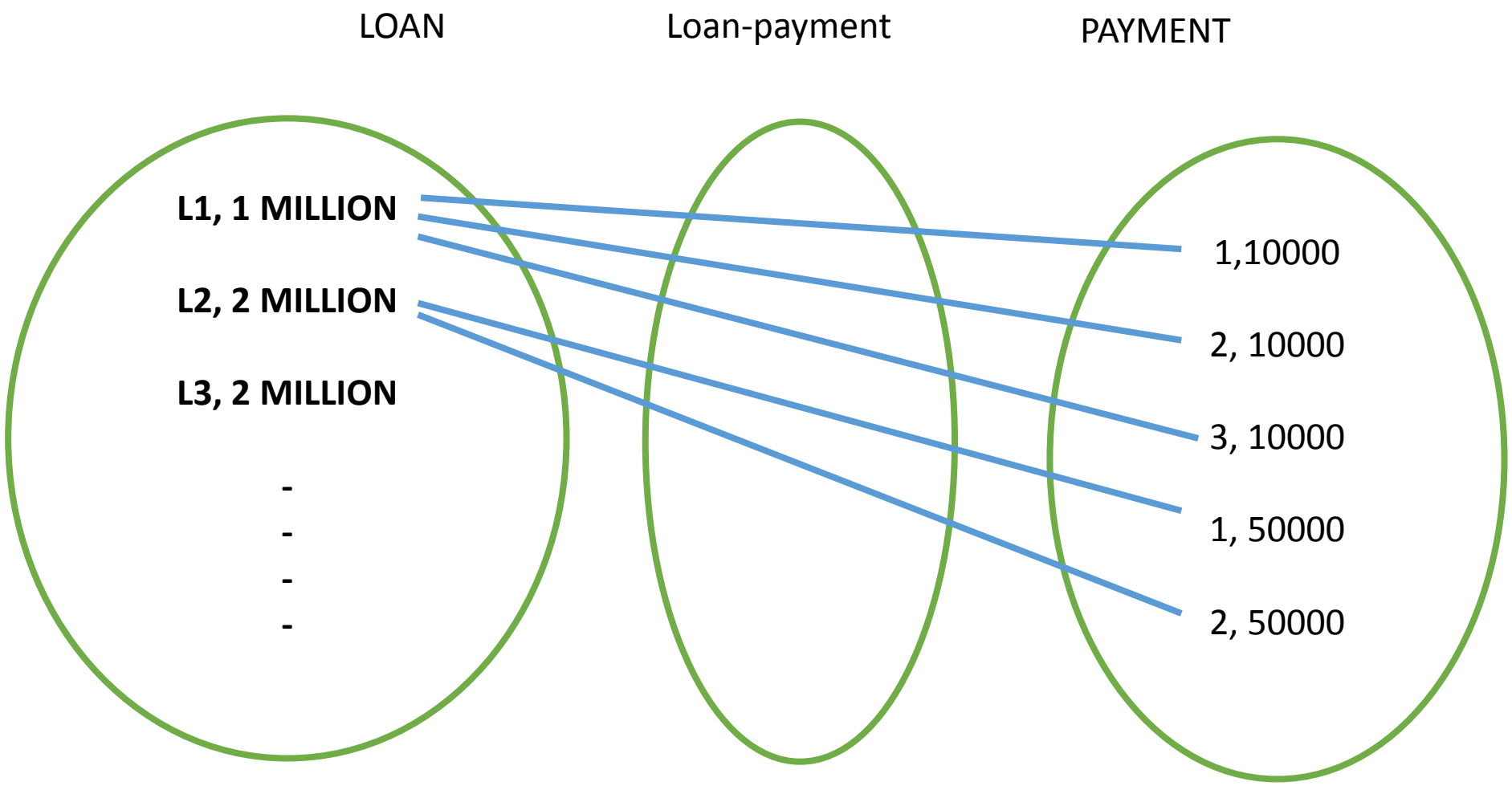
Weak and Strong Entity Sets

- An entity set may not have sufficient attributes to form a primary key. Such an entity set is termed a **weak entity set**.
- An entity set that has a primary key is termed a **strong entity set**.
- For e.g., consider the entity set payment, which has the three attributes: payment-number, payment-date, and payment-amount. Payment numbers are typically sequential numbers, starting from 1, generated separately for each loan. Thus, although each payment entity is distinct, payments for different loans may share the same payment number. Thus, this entity set does not have a primary key; it is a weak entity set.

Weak and Strong Entity Sets



Weak and Strong Entity Sets



Weak and Strong Entity Sets

- For a weak entity set to be meaningful, it must be associated with another entity set, called the **identifying** or **owner entity set**.
- Every weak entity must be associated with an identifying entity; that is, the weak entity set is said to be **existence dependent** on the identifying entity set.
- The identifying entity set is said to **own** the weak entity set that it identifies.

Weak and Strong Entity Sets

- The relationship associating the weak entity set with the identifying entity set is called the **identifying relationship**.
- The identifying relationship is **many to one** from the weak entity set to the identifying entity set, and the participation of the weak entity set in the relationship is **total**.
- In our example, the identifying entity set for payment is loan, and a relationship loan-payment that associates payment entities with their corresponding loan entities is the identifying relationship.

Weak and Strong Entity Sets

- Although a weak entity set does not have a primary key, we nevertheless need a means of distinguishing among all those entities in the weak entity set that depend on one particular strong entity.
- The **discriminator** of a weak entity set is a set of attributes that allows this distinction to be made.
- For e.g., the discriminator of the weak entity set payment is the attribute payment-number, since, for each loan, a payment number uniquely identifies one single payment for that loan.

Weak and Strong Entity Sets

- The discriminator of a weak entity set is also called the **partial key** of the entity set.
- The primary key of a weak entity set is formed by the primary key of the identifying entity set, plus the weak entity set's discriminator.
- In the case of the entity set payment, its primary key is **{loan-number, payment-number}**, where loan-number is the primary key of the identifying entity set, namely loan, and payment-number distinguishes payment entities within the same loan.

Weak and Strong Entity Sets

- The identifying relationship set should have no descriptive attributes, since any required attributes can be associated with the weak entity set.
- A weak entity set can participate in relationships other than the identifying relationship.
- A weak entity set may participate as owner in an identifying relationship with another weak entity set.
- It is also possible to have a weak entity set with more than one identifying entity set. A particular weak entity would then be identified by a combination of entities, one from each identifying entity set.
- The primary key of the weak entity set would consist of the union of the primary keys of the identifying entity sets, plus the discriminator of the weak entity set.

GATE Question

- Which of the following is used to represent the supporting many-one relationships of a weak entity set in an entity-relationship diagram?
  A. Diamonds with double/ bold border
  B. Rectangles with double/ bold border
  C. Ovals with double/ bold border
  D. Ovals that contain underlined identifiers

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Steps in ER Modelling

- Usually the following five steps are followed to generate ER models
  1. Identify the entity set.
  2. Identify the relevant attributes.
  3. Identify the prime attribute.
  4. Find relationships between entity set.
  5. Draw a complete ER model.

Question 1

- Draw an ER Model for an University database application where
  a) A University has many departments.
  b) Each department has multiple instructors; one among them is the head of the department.
  c) An instructor belongs to only one department.
  d) Each department offers multiple courses, each of which is taught by a single instructor.
  e) A student may enroll for many courses offered by different departments.

Step 1: Identify the entity set

- From the given question, we can identify the following entity sets.
  1. DEPARTMENT
  2. COURSE
  3. INSTRUCTOR
  4. STUDENT
- “Head of the department” is NOT an entity set; it is relationship between the INSTRUCTOR and DEPARTMENT entities.

Step 2: Identify the relevant attributes

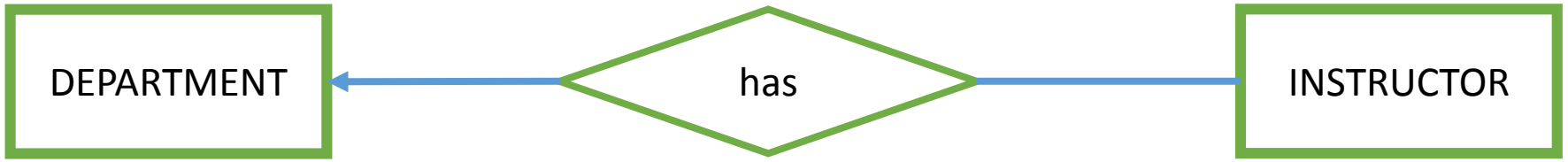
- For the **DEPARTMENT** entity set the relevant attributes are Dept_No, Dept_Name and Location.
- For the **COURSE** entity set the relevant attributes are Course_No, Course_Name, Duration, and Pre-requisite.
- For the **INSTRUCTOR** entity set the relevant attributes are Inst_Id, Inst_Name, Room_No, and Telephone_No.
- For the **STUDENT** entity set the relevant attributes are Student_No, Student_Name, and Dob.

Step 3: Identify the Prime (key) attribute

- Dept_No is the key attribute for **DEPARTMENT** entity set.
- Course_No is the key attribute for **COURSE** entity set.
- Inst_Id is the key attribute for **INSTRUCTOR** entity set.
- Student_No is the key attribute for **STUDENT** entity set.

Step 4: Identify the relationship between entity sets

1. Each department has multiple instructors and an instructor belongs to only one department.



Step 4: Identify the relationship between entity sets

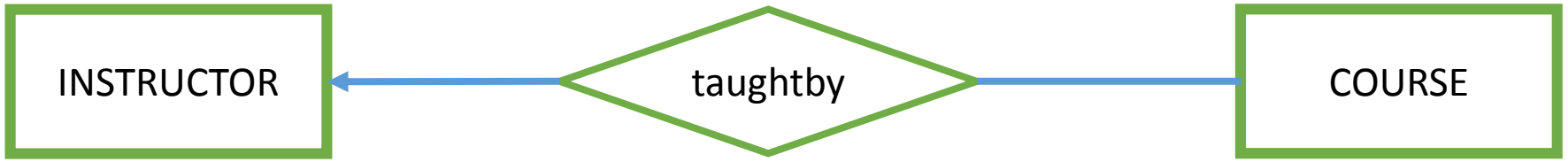
2. Each department has multiple instructors; one among them is the head of the department.

Step 4: Identify the relationship between entity sets

3. Each department offers multiple courses.

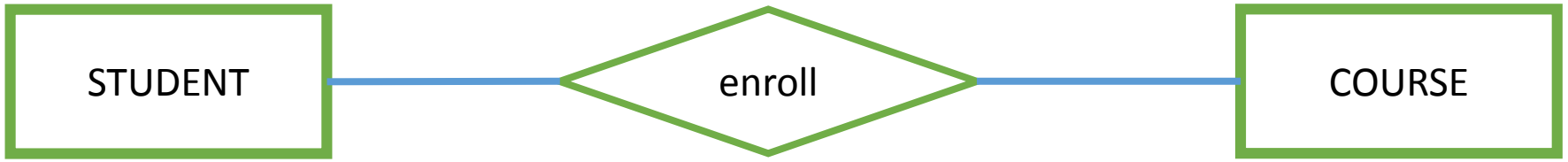
Step 4: Identify the relationship between entity sets

4. Each department offers multiple courses, each of which is taught by a single instructor.

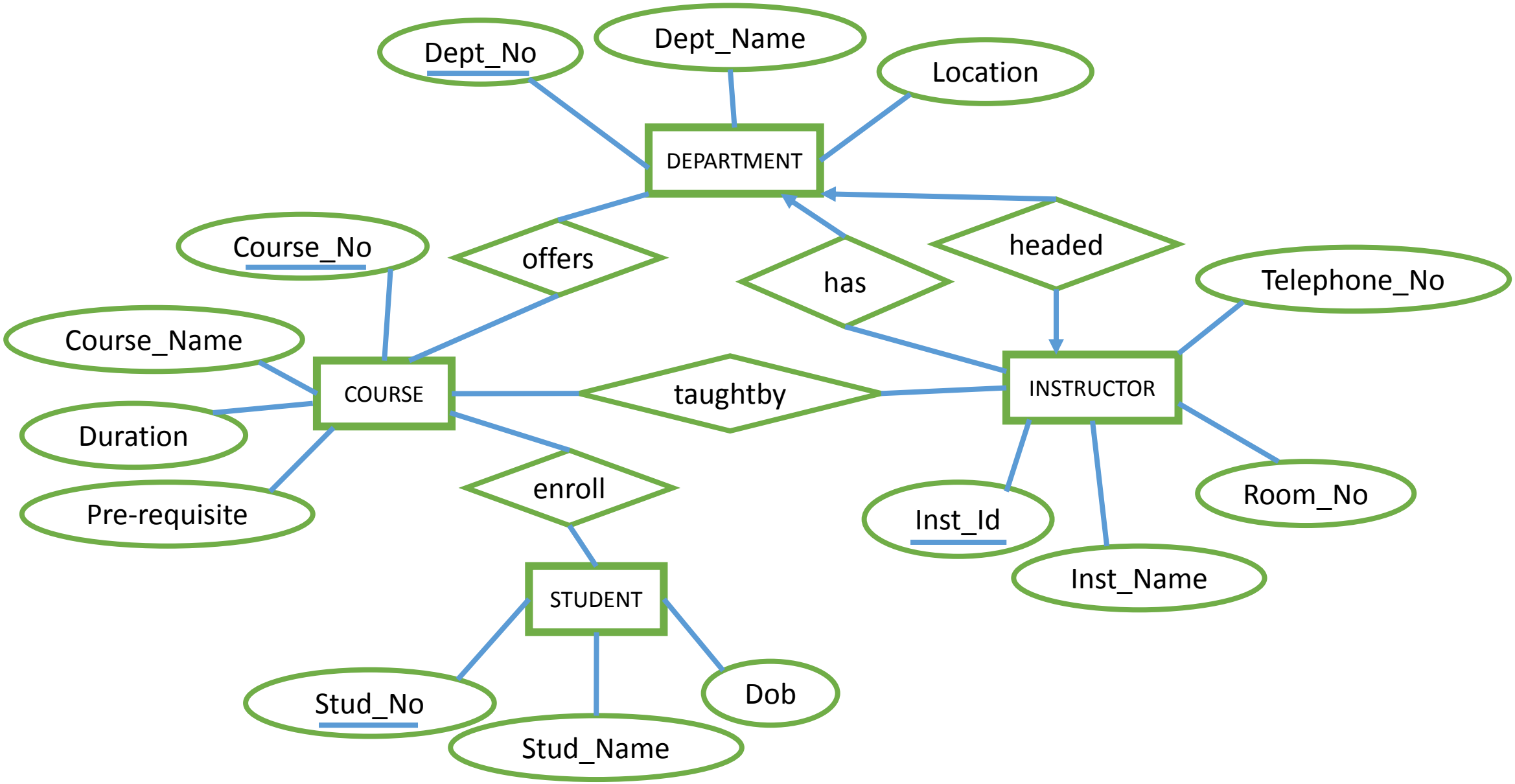


Step 4: Identify the relationship between entity sets

5. A student may enroll for many courses offered by different departments



Step 5: Draw the complete E R Diagram



University Questions

1. Write short notes on

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The link for my youtube channel is

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