EIE3112 Database System
Tutorial: ER Diagrams

Q1 Give an example E-R diagram for the entities DEPARTMENT and EMPLOYEE, which have a 1:N relationship. Assume that a DEPARTMENT does not need to have any EMPLOYEE but that every EMPLOYEE does have a DEPARTMENT. Assume also that DEPARTMENT has DeptNo as its primary key and that EMPLOYEE has EmpNo as its primary key.

Q2 (a) A database involves the relationship between parts, the vendors providing the parts, and the products that use the parts. Specifically, a part is supplied by at least one vendor. Each vendor may supply many parts; but some new vendors may supply none. Each product is composed of one or more parts. A part may be used by many products; but some new parts may not be used by any product. Draw an entity-relationship diagram to illustrate the relationships among the entities Part, Vendor, and Product. In your solution, many-to-many relationships should be converted into one-to-many relationships. It is not necessary to provide attributes for the entities but you need to underline primary keys in each entity.

Q2 (b) Extend the above ER diagram for the following cases:

1. A customer may receive zero or many sales invoices. One sales invoice must involve one customer only.
2. An order from a customer must have at least one product. A product may be involved in many orders or no order at all. A customer could have multiple orders or may not have any order. An order can only be associated with exactly one customer.

Note: MySQL Workbench will automatically convert M-N relationship to two 1-M relationship. You need to change the name of the associative entity and the relationship to fit the context.

Q3 The Hollywood studio ABC wants to have a database designed to store the information of movies, including

- Title of the movie;
- Year released;
- Director
- Actors.

A movie has only one title, and one director. A director may not direct any movie but could also direct multiple movies. An actor can act in many movies or may not act in any movie at all. A movie has at least one actor.

1. How does DIRECTOR and MOVIE relate to each other?
2. How does ACTOR and MOVIE relate to each other?
3. Draw an ER diagram representing the relationship between DIRECTOR, MOVIE, and ACTOR.
4. If we want to store also the Oscar award for the best actor, how would you store this information?

Q4 The ABC ice-skating club offers both private, semi-private, and group lessons.

- For private lessons, each lesson has 1 instructor and 1 student.
- For semi-private lessons, each lesson has 1 instructor and 2-4 students.
- For group lessons, each lesson has 1 instructor and 8-10 students.
- A student can take zero or many lessons.
- Each lesson requires exactly one instructor.
- An instructor can teach zero or multiple lessons.

Draw the ER diagram to model the above information.

Q5 Consider the following information about a university database:

- Professors have a staffID, firstname, lastname, age, a rank and a research specialty.
- Projects have a project number, a starting date, an ending date and a budget.
- Graduate students have a pstdID (postgraduate student ID), firstname, lastname, age and a degree program (MS or PhD)
- Each project is managed by one professor. A professor can manage multiple projects.
- Each project is worked by one or more graduate students. A graduate student can work on multiple projects. It is, however, possible that a graduate student does not work on any project.
- A department has a department number, a department name and a main office.
- A professor can only work in one department.

Design and draw an ER diagram that captures the information about the university.

Q6 A database is to be created for plays which tour round different theatres of a country during a season. Each play involves many performances with each particular performance being involved with just one play. But some plays do not have any performance. A theatre will host many performances with each performance hosted by just one theatre, but some theatre does not have any performance to host. An actor may perform in more than one play (although some actors perform in no plays over a season). A play involves at least two actors. Each play is directed by just one director with some directors directing more than one play. But some director does not have a play to direct.

- Play details include play ID, play name, play type, and length.
- Actor details include actor ID, actor name, date of birth and gender.
- Director details include director ID, director name, phone number and experience level.
- Performance details include performance ID, performance date, performance time and performance revenue.
- Theatre details include theatre code (unique), theatre name, location and number of seats.

(a) State the entity types and their unique identifiers (PK). State also the relationship details (name, cardinality and participation constraints)
(b) Draw the ER diagram.