HW #2 ER Diagram

Part 1:

- Given the following requirements for the design of a database about Course, draw an **ER diagram** for the database. If you feel like you must take some assumptions, please state them clearly.
- Remember to indicate the **key** for each entity, as well as the **multiplicity** of each relationship (e.g., one-to-many, many-to-many) using the appropriate notation.
- A *course* should have a title and a unique CRN.
- A *course* is taught by at most one *person*.
- A *course* is offered by at most one *department*.

HW #2 (2)

- A *department* can offer many *courses*, a teacher can also teach many *courses*.
- A *department* has a name and a unique department ID.
- A *person* has age, a name, and a unique SSN.
- Each *person* can belong to multiple *departments*. Every *department* also has many *people* associated with it.
- A *course* has many students registered for it. Students are *people* too.
- Each student can register for multiple *courses*.
- A *classroom* has a building name and a room number.
- Each *classroom* can be uniquely identified by the combination of its building name and its room number.

HW #2 (3)

- A *course* uses at most one *classroom*.
- A *classroom* can be used for more than one *course*.

Part 2:

- Answer the following questions. State any assumptions you may have.

2A. If a *course* must be taught by exactly one *teacher*, what kind of ER constraint should you use? Draw an ER diagram of the *teacher* and *course* entities and relationship between them to represent the constraint property.

HW #2 (4)

2B. Give an example of weak entity sets. Draw it in an ER diagram using the notation of weak entity sets.

2C. Given the following short description, draw an ER diagram for the subclassed entities. Be sure to mark the keys, if applicable.

- A *Talk Show* is a *TV Show*, but also has a host. A host is a *person*. Every *Talk Show* has at most one host.
- A *Drama* is also a *TV Show*. Drama has many actors, which are all *people*.
- A *TV Show* has its channel and a unique name.
- A *person* has a name and a unique SSN.

HW #2 (5)

- Note: you also need to show the relationship between the shows and people.

Part 3:

3A. Using the description of the Courses database in **Part 1** (and your subsequent ER diagram), write a corresponding relational schema. Try to minimize the number of relations your solution has, and merge relations where possible. Do not forget to specify keys.

3B. If we add another constraint that a *person* belongs to at most **one** *department*, how would this change your relational schema?

HW #2 (6)

Part 4:

- Write the SQL statements for the following tasks.
- For simplicity, all “String” variables should be of type VARCHAR(50) and all “Number” variables should be of type Int.
- Remember to specify the primary key of each table, and do not allow the keys to have NULL values:

4A. Add a table called Person with a primary key of SSN, and attributes of Age and Name. Every person must have a name. (Age is a number, the rest are strings. Note: SSN is a string, not a number).

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4B. Add a table called Movie with a primary key of Title, and attributes of Release_year and Rating. (Title is a string, the rest are numbers).

4C. Create a table called Act, which is a “Many-to-Many” relationship between Person and Movie. (A Person can act in many movies, and a movie can have many actors acting in it).

4D. Insert a record into the Person table with the data: SSN=1234567, Age=58, Name=John Travolta.

4E. Drop the Movie table.

HW #2 (8)

Part 5:

- The aim of the homework is to design a reservation system for airline companies. The following statements describe the requirements.

- Each company has an ID and owns many aircrafts. Each aircraft has a registration number, make, model, and the maximum capacity of passengers.

HW #2 (9)

- Each company has many flights. Flight has a flight number that can be classified into domestic or international routes. Each flight departs from and arrives at registered airports.

- An airport also has an airport code, description name, city and country information. Flight may stop at some intermediate stops. Customers could take a transfer flight from intermediate stops.

HW #2 (10)

- Each flight has three seat classes: First Class, Business Class, and Economy class.
- For each flight, the system should store a list of available seats. The seat arrangements are associated with aircrafts. Each seat can only be reserved to one customer. Ticket prices are associated with classes and time.

- Customer can make reservation without reserving seats.

HW #2 (11)

- Each flight allows 20% overbooking.
- The reservation system should keep the following information: 1) a unique identifier for each customer. This identifier is assigned automatically once customers make a new reservation in the system; 2) customer information; 3) flight information; 4) the time that reservation was made; 5) a credit-card number associated with the reservation;

HW #2 (12)

6) A flag which indicates whether this particular reservation is paid or not. When a reservation is paid it is transformed automatically to a ticket. The reservation can be cancelled before flight departure, however, the ticket is still valid (to exchange some products).

- Each reservation might be associated with many flights.

HW #2 (13)

Part 5A:

- Draw an ER diagram for this system.
- You must mark all the primary keys and cardinalities.
- You must write down your assumption for your ER diagram.

HW #2 (14)

Part 5B:

- Translate the ER diagram into relational tables. Use SQL create_table command to define all the relational tables.

HW #2 (15)

Part 6:

- The movie-on-demand (MoD) provider operates several video servers in different geographical locations that let customers view movies at home via a special set-top box that interfaces with their TV and that further connects to that video server network.

- The database must represent the following information:

HW #2 (16)

- Video movie information: A movie has a title, release date, rating, running time, director, and one or more actors.

- Movies are split between domestic and foreign movies.
- A foreign movie uses a language other than English and may provide English subtitle.

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- Domestic movies are further categorized into comedy, drama, action, and horror movies.

- A comedy movie has the degree of “funniness” which ranges between 1 and 5. A drama movie has a short description such as “love story”, “documentary”紀錄片, “humanity”人性, etc.

HW #2 (18)

- Each movie could be viewed by one or more critics, each of whom evaluates it as between zero and five stars.
- A critic has a name and a phone number. He or she might review one or more movies.

- A movie may have won one or more academy awards (i.e., “Oscars”). If that is the case, then the movie has a list of all the categories in which it won, e.g., “best picture”, “best actor”, “best actress”, etc.

HW #2 (19)

- Each movie is stored on a number of different video servers. Each video server has a unique ID and an address (location).
- If a customer requests a movie then that movie is delivered (streamed) from one of the video servers to the customer’s home.

- Each movie can be supplied by only one distributor.

HW #2 (20)

- One distributor might provide several movies. For each distributor, the MoD provider keeps track of information about its name, address, and phone number.

- A distributor’s address can be accessed as street address, city, state, and zip code individually. However, the entire address of a distributor can also be retrieved as a unit.

HW #2 (21)

- Employee information: An employee has a name, a social security number, date of birth, salary, and a phone number.
- He or she may have a supervisor.
- Employees are either permanent or temporary, but not both.
- A supervisors are permanent employees.
- An employee works at the location of one of the video server.

HW #2 (22)

- Customer information: A customer has a social security number, a name, a phone number, and an address.

- Each customer must have one or more credit cards. Each credit card includes a type of credit card (Visa / MasterCard /…), a card number, and an expiration date.

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- Viewing transaction information: Each customer can view movies from a video server. For each viewing transaction, the viewing date and time is recorded.

- Billing statement information: Each customer receives one bill statement after each viewing transaction. Each statement has a billing date, a billing number, one or more movie titles, and a total charge.

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- A billing number is unique for a particular customer. It is not unique across different customers.

- Release charge information: For each movie, a release charge type is defined. Arbitrarily recent movies are marked as “new release”, whereas others are marked as “ordinary release”.

HW #2 (25)

- The store keeps track of different charge information for different release types.

- For newly released movies, the fee is $100 for the first viewing and $30 for each additional viewing.
- For the other ones, the fee is $50 for the first viewing and $15 for each additional viewing.

HW #2 (26)

Part 6A:

- Draw an ER diagram for the system.
- Indicate keys, relationships, weak entity sets, and other features as many as possible.

HW #2 (27)

Part 6B:

- Show the SQL statements for creating relations corresponding to the entity sets and relationship sets in your design.

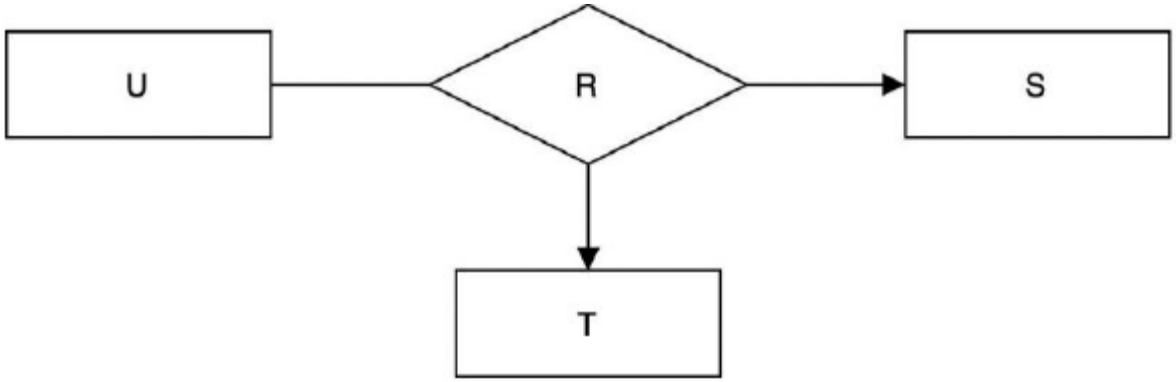
HW #2 (28)

Part 7:

- Suppose u, r, t, s be the number of tuples in U, R, T, S respectively. Are the following possible combinations of values for u, r, t, s? Write “Yes” (for valid), and “No” (for invalid).

7a. u = 4, s = 3, t = 2, r = 1

7b. u = 50, s = 1, t = 1, r = 100



HW #2 (29)

Part 8:

- Suppose you are given the following requirements for a simple database for the National Hockey曲棍球 League (NHL):
- the NHL has many teams,
- each team has a name, a city, a coach, a captain, and a set of players,
- each player belongs to only one team,

HW #2 (30)

- each player has a name, a position (such as *left wing* or *goalie*守門員*),* a skill level, and a set of injury records,
- a team captain is also a player,
- a game is played between two teams (referred to as host_team and guest_team) and has a date (such as *May 11th, 1999*) and a score (such as *4 to 2*).

HW #2 (31)

- Construct a clean and concise ER diagram for the NHL database using the notation as in your textbook. List your assumptions and clearly indicate the cardinality mappings as well as any role indicators in your ER diagram.

HW #2 (32)

Part 9:

- Design a database for a small part of hospital administration.
- The hospital has several doctors. For each doctor we store his/her id and specialty.
- At arrival the patients are examined by a particular doctor. After being admitted each patient is treated by one or more doctors.

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- Each treatment is stored with date, description, and results.
- As part of a particular treatment a doctor can order tests done on the patient. For each test we need to store an identification of the test, type of test (blood test, urine尿液 test, x-ray, etc.), date, test technician and its outcome. In addition some personal information needs to be stored on each patient.

HW #2 (34)

- Set this information up into an entity-relationship diagram including all the constraints that appear in the description. For each relationship in the diagram justify its properties by referring to the above text or specify an assumption that you have made.