Esame di Basi di Dati

Exercise 1 Design an ER conceptual schema for a naval transport company.

The transport company manages a fleet of ships, each identified by a code and characterized by the builder name, the model, and the maximum payload. A ship can be either property of the company (in such a case, we also store the year in which the ship has been bought and the amount paid for it), or it may be rented by the company (in that case, we store the annual fee and the day and month in which such a fee is due).

Each ship undergoes a series of maintenance operations. Each maintenance of a given ship is identified by an incremental number within the maintenance history of the ship. For each maintenance operation, we keep track of the specific operations performed (an operation is identified by a code and characterized by a description) and the duration (in number of days).

The naval transport company operates, each week, a series of scheduled transports. For each scheduled transport, we store the code, the harbour of departure, the harbour of arrival, the duration and the scheduled weekday/time of departure. Other than the transport schedule, we also want to keep track of the actual transports that take place, each uniquely identified by its day and time of departure, within its schedule. For each transport, we finally keep track of the ship that has been used. Finally, for each ship, we want to keep track of the total number of transports in which it has been used.

Build an ER schema that describes the above mentioned requirements, clearly explaining any assumptions you made. In particular, for each entity, identify its candidate keys, and carefully specify the constraints associated with each relation. For each derived attribute describe, in natural language, how its value should be calculated from the other information contained in the schema.

Exercise 2 Let us consider the following relational schema about painters and paintings

$PAINTER(name, surname, birth\_date, nationality)$

$PAINTING(title, style, size\_height, size\_width)$

$PAINTS(painter\_name, painter\_surname, painting\_title, painting\_style)$

Let us assume each painter to be uniquely identified by his/her name and surname, and characterized by his/her birth date and nationality. We further assume that there may be more than one painting with the same title, however,

given a style, that cannot be two different paintings having the same title. A painting may be painted by more than one painter, and a painter can paint, in general, more than one painting.

Given the previously mentioned assumptions, define the primary keys and foreign keys (if any).

Exercise 3 Based on the relations of Exercise 2, formulate SQL queries to compute the following data:

- all information regarding painters that have painted only paintings of style *surrealist*;
- the name and surname of the painters that have painted the highest number of paintings.