Assignment 1: Entity Relationship Diagrams

Course ISE 322: Database Systems

Due November 11, 2009

Solve exercises 2.2 and 2.4 in Ramakrishnan and Gehrke Book in English or Hebrew. You may turn the answers on this page or on separate paper(s) so long as the question numbers are indicated. The questions are reproduced below for your convenience.

1 Question 1: Exercise 2.2 (5 points each / 30 points total)

A university database contains information about professors (identified by social security number, or SSN) and courses (identified by courseid). Professors teach courses; each of the following situations concerns the Teachers relationship set. For each situation, draw an ER diagram that describes it (assuming no further constraints hold).

1. Professors can teach the same course in several semesters, and each offering must be recorded.
2. Professors can teach the same course in several semesters, and only the most recent such offering needs to be recorded. (Assume this condition applies in all subsequent questions).
3. Every professor must teach some course
4. Every professor teaches exactly one course (no more, no less).
5. Every professor teaches exactly one course (no more, no less) and every course must be taught by some professor.
6. Now suppose that certain courses can be taught by a team of professors jointly, but it is possible that no one professor in a team can teach the course. Model this situation, introducing additional entity sets and relationship sets if necessary.

2 Question 2: Exercise 2.4 (25 points)

A company database needs to store information about employees (identified by *ssn*, with *salary* and *phone* as attributes), departments (identified by *dno*, with *dname* and *budget* as attributes), and children of employees (with *name* and *age* as attributes). Employees *work* in departments; each department is *managed by* an employee; a child must be identified uniquely by *name* when the parent (who is an employee; assume that only one parent works for the company) is known. We are not interested in information about a child once the parent leaves the company.

Draw an ER diagram that captures this information.

3 Question 3: Exercise 2.6 (50 points)

Computer Sciences Department frequent fliers have been complaining to Dane County Airport officials about the poor organization at the airport. As a result, the officials decided that all information related to the

airport should be organized using a DBMS, and you have been hired to design the database. Your first task is to organize the information about all the airplanes stationed and maintenance at the airport. The relevant information is as follows:

1. Every airplane has a registration number, and each airplane is of a specific model.
2. The airport accommodates a number of airplane models, and each model is identified by a model number (e.g., DC-10) and has a capacity and a weight.
3. A number of technicians work at the airport. You need to store the name, SSN, address, phone number, and salary of each technician.
4. Each technician is an expert on one or more plane model(s), and his or her expertise may overlap with that of other technicians. This information about technicians must also be recorded.
5. Traffic controllers must have an annual medical examination. For each traffic controller, you must store the date of the most recent exam.
6. All airport employees (including technicians) belong to a union. You must store the union membership number of each employee. You can assume that each employee is uniquely identified by a social security number.
7. The airport has a number of tests that are used periodically to ensure that airplanes are still airworthy. Each test has a Federal Aviation Administration (FAA) test number, a name, and a maximum possible score.
8. The FAA requires the airport to keep track of each time a given airplane is tested by a given technician using a given test. For each testing event, the information needed is the date, the number of hours the technician spent doing the test, and the score the airplane received on the test.

Based on the above requirements, perform the following tasks:

1. (40 points) Draw an ER diagram for the airport database. Be sure to indicate the various attributes of each entity and relationship set; also specify the key and participation constraints for each relationship set. Specify any necessary overlap and covering constraints as well (in English or Hebrew).
2. (10 points) The FAA passes a regulation that tests on a plane must be conducted by a technician who is an expert on that model. How would you express this constraint in the ER diagram? If you cannot express it, explain briefly.