

Homework 1  
CS 3200  
Due September 23, 2015

1. Explain the following terms briefly: *attribute, domain, entity, relationship, entity set, relationship set, one-to-many relationship, many-to-many relationship, participation constraint, overlap constraint, covering constraint, weak entity set, aggregation, and role indicator*. (14 points)
2. Describe the structure of a DBMS. If your operating system is upgraded to support some new functions on OS files (e.g., the ability to force some sequence of bytes to disk), which layer(s) of the DBMS would you have to rewrite to take advantage of these new functions? (11 points)
3. A university database contains information about professors and courses. Professors are identified by social security number, or SSN and courses are identified by courseid. Professors teach courses; each of the following scenarios concerns the Teaches relationship set between courses and professors. For each of the following 5 scenarios, draw an ER diagram that describes it. Please assume that no other constraints hold. (20 points)
  1. Professors can teach the same course in several semesters, and each offering must be recorded and tracked.
  2. Professors can teach the same course in several semesters, and only the most recent such course offering needs to be recorded. (Assume this condition applies in all subsequent scenario.)
  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.
4. 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. (10 points)
5. A database will be made to store information about patients in a hospital. On arrival, each patient's personal details (name, address, Insurance, and telephone number) are recorded where possible, and they are given an admission number. Each patient is then assigned to one of the following wards (Emergency, Cardiology, Oncology, Maternity, Pediatric, Psychiatric, Intensive care, Neurology). In each ward, there are a number of doctors and nurses. Nurses and doctors work in only one specific ward. A patient will be treated by one doctor and several nurses over the course of their stay, and each doctor and nurse may be involved with several patients at any given time.

Investigate two of the following tools (or two of your own choice) and draw an entity-relationship diagram showing the items you identified as well as the cardinality ratios. (Tools: <http://dia-installer.de/shapes/ER/index.html.en>; <https://products.office.com/en-us/Visio/visio-professional-2013-free-trial-flowchart-software>; <https://www.omnigroup.com/omnigraffle>; <https://www.gliffy.com/>) (30 points)

6. Represent the entities for problem 5 using SQL create commands. The commands should provide referential integrity rules, primary keys and foreign key constraints. (15 points)