

COP 4710 – Database Systems – Spring 2004

Homework #1 – 100 points

Due: **In class Wednesday January 28th**. NO LATE ASSIGNMENTS ACCEPTED

Answer each of the following questions completely. Make sure that your answers are neatly written and very readable. Points will be deducted if your assignment is not presented in a neat format. For example, don't turn it in on notebook paper torn out of a spiral notebook.

1. (20 points – 5 points each)

Construct an E-R diagram (ERD) for each of the following “real-world” scenarios. Assume no additional constraints, other than those which are explicitly stated, hold in each case.

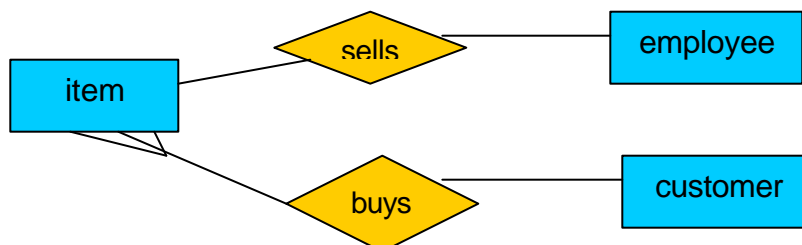
The real world that is to be modeled is a university and the database is to contain information about professors (identified by SSN) and courses (identified by a courseid). Professors teach courses.

- (a) Professors can teach the same course in several different semesters, and each offering must be recorded.
- (b) Every professor must teach some course.
- (c) Every professor teaches exactly one course (no more, no less).
- (d) Every professor teaches exactly one course (no more, no less) and every course must be taught by some professor.

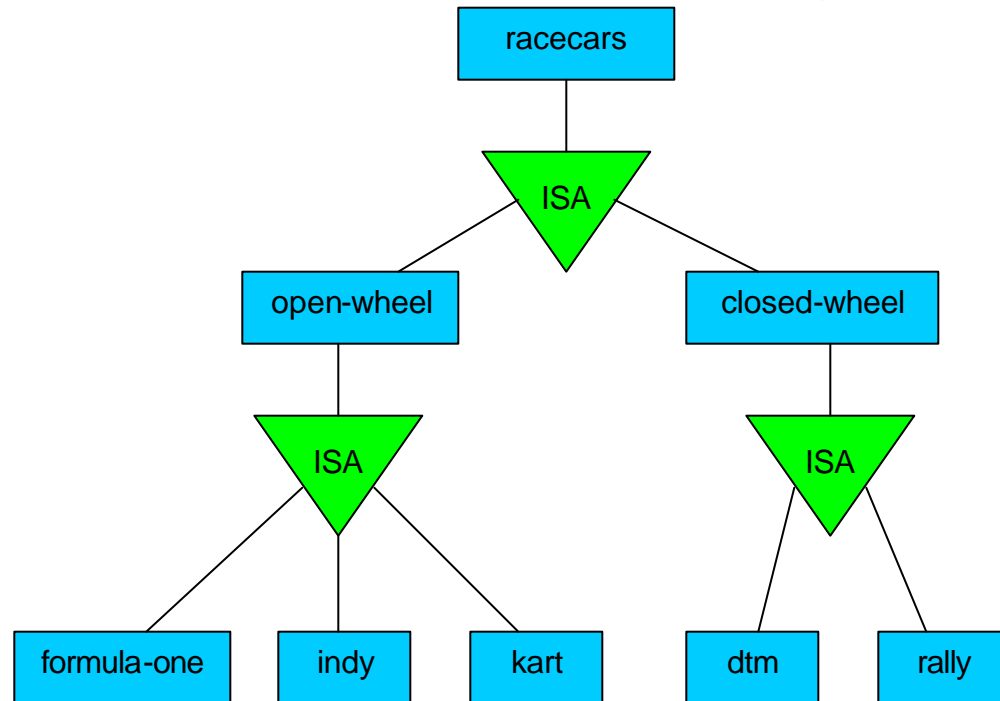
2. (20 points – 5 points each)

In each problem below a real-world situation is described and modeled using an ERD. In each case determine if the ERD correctly models the situation which is described and if it does not, draw a correct version.

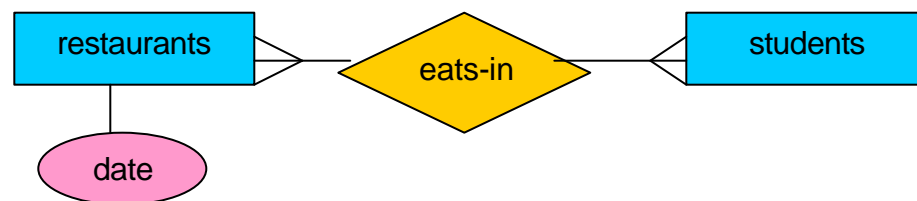
- (a) Entity sets: employee, customer, items. Relationship sets: sells (an employee sells items), buys (a customer buys items). Constraints: (1) every employee must sell an item, but every item does not need to be purchased, (2) not every customer necessarily buys an item.



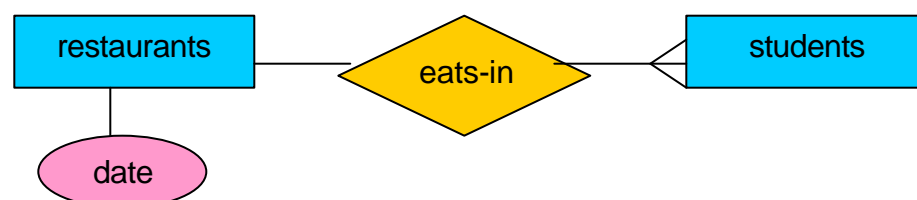
- (b) Consider the entity set *racecars*. Within this set there are two basic types of racecars that we will distinguish, *open-wheel* and *closed-wheel*. Open-wheel racecars are further subdivided into *formula-one*, *indy*, and *karts*. Closed-wheel racecars are subdivided into *dtm* and *rally*. For our purposes here, we will assume that every racecar must fall into one of these categories.



- (c) Given the entity sets of *students* and *restaurants*. Assume that students *eat-at* certain restaurants. Any student can eat in any restaurant (including none of them) on a given day and we want to record for each student the date that they last ate in each restaurant.

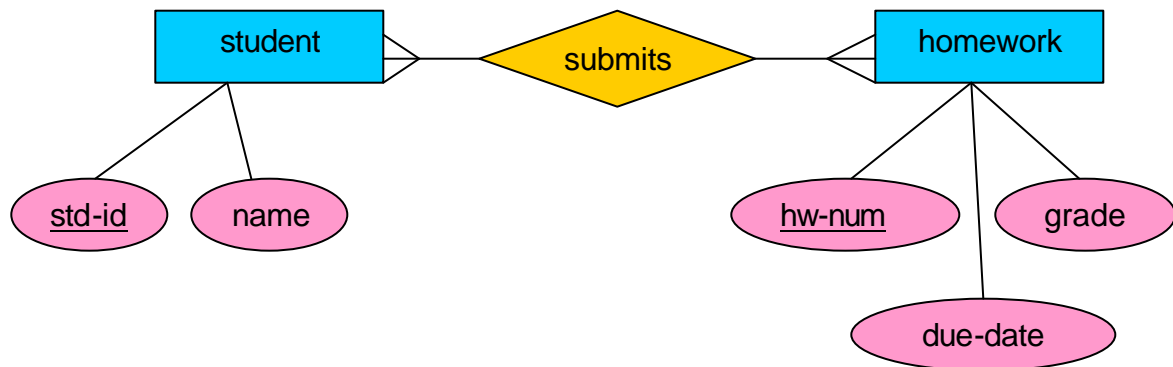


- (d) Given the same situation as in (c) above, only this time assume that a given student only ever eats in their favorite restaurant.



3. (15 points)

Consider modeling a segment of a *course* at UCF. In this course, students submit assignments for grading (not unlike this one). Each assignment has a number (such as HW#1) and a due date. When a student submits their homework assignment the assignment will receive a grade. Explain why the following ERD does **not** properly model this real-world situation. Be very specific in your answer. Draw an ERD that correctly models this situation.



4. (25 points)

Construct an ERD which accurately represents a university assuming that the following information is to be represented in the database.

- Professors have a SSN, name, rank, and research-specialty.
- Projects have a project-number, sponsor-name, starting-date, ending-date, and budget.
- Graduate students have a SSN, name, and a degree-program (MS or PhD).
- Each project is managed by one professor (known as the PI).
- Each project is worked on by one or more professors (each known as a CI).
- Professors can manage and/or work on multiple projects.
- Each project is worked on by one or more graduate students (each known as a RA).
- When a graduate student works on a project, a professor must supervise their work on the project. Graduate students can work on multiple projects, in which case they will have a potentially different supervisor for each one.
- Departments have a department-id, name, and a main-office-number.
- Departments have a professor known as the chairman who runs the department.
- Professors work in one or more departments, and for each department that they work in, a time percentage is associated with their job in that department.

5. (20 points)

Use the ERD shown below, which models a banking database, to answer the following questions.

1. List all of the strong entities in this ERD.
2. If there are any weak entities, list them, identify the discriminator (partial key), and list the identifying relationship.
3. Define structural constraints that would model a customer having no more than two loans, has at least one account, and no branch can have more than 500 loans in total.

