

**COMPSCI 410/510 Databases, Spring 14**

Homework 1, 100 points

Due on Wednesday **2/19/14, 11pm MST**

5 points extra credit if you type your homework solutions

**30 points**

1. Consider a database system for a baseball organization such as the major leagues. The data requirements are summarized as follows:
  - The personnel involved in the league include players, coaches, managers, and umpires. Each is identified by a unique personnel id. They are also described by their first and last names along with the date and place of birth.
  - Players are further described by other attributes such as their batting orientation (left, right, or switch) and have a lifetime batting average (BA).
  - Within the players group is a subset of players called pitchers. Pitchers have a lifetime ERA (earned run average) associated with them.
  - Teams are uniquely identified by their names. Teams are also described by the city in which they are located and the division and league in which they play (such as Central division of the American League).
  - Teams have one manager, a number of coaches, and a number of players.
  - Games are played between two teams with one designated as the home team and the other the visiting team on a particular date. The score (runs, hits, and errors) are recorded for each team. The team with the most runs is declared the winner of the game.
  - With each finished game, a winning pitcher and a losing pitcher are recorded. In case there is a save awarded, the save pitcher is also recorded.
  - With each finished game, the number of hits (singles, doubles, triples, and home runs) obtained by each player is also recorded. Design an Enhanced Entity-Relationship diagram for the BASEBALL database.

**40 points**

2. Consider a GRADE\_BOOK database in which instructors within an academic department record points earned by individual students in their classes. The data requirements are summarized as follows:
- Each student is identified by a unique identifier, first and last name, and an e-mail address.
  - Each instructor teaches certain courses each term. Each course is identified by a course number, a section number, and the term in which it is taught. For each course he or she teaches, the instructor specifies the minimum number of points required in order to earn letter grades A, B, C, D, and F. For example, 90 points for an A, 80 points for a B, 70 points for a C, and so forth.
  - Students are enrolled in each course taught by the instructor.
  - Each course has a number of grading components (such as midterm exam, final exam, project, and so forth). Each grading component has a maximum number of points (such as 100 or 50) and a weight (such as 20% or 10%). The weights of all the grading components of a course usually total 100.
  - Finally, the instructor records the points earned by each student in each of the grading components in each of the courses. For example, student 1234 earns 84 points for the midterm exam-grading component of the section 2 course CSc2310 in the fall term of 2009. The midterm exam-grading component may have been defined to have a maximum of 100 points and a weight of 20% of the course grade. Design an Enhanced Entity-Relationship diagram for the grade book database.

**30 points**

3. Consider an entity type SECTION in a UNIVERSITY database, which describes the section offerings of courses. The attributes of SECTION are Section\_number, Semester, Year, Course\_number, Instructor, Room\_no (where section is taught), Building (where section is taught), Weekdays (domain is the possible combinations of weekdays in which a section can be offered {'MWF', 'MW', 'TT', and so on}), and Hours (domain is all possible time periods during which sections are offered {'9-9:50 A.M.', '10-10:50 A.M.', ..., '3:30-4:50 P.M.', '5:30-6:20 P.M.', and so on}). Assume that Section\_number is unique for each course within a particular semester/year combination (that is, if a course is offered multiple times during a particular semester, its section offerings are numbered 1, 2, 3, and so on). There are several composite keys for section, and some attributes are components of more than one key. Identify three composite keys, and show how they can be represented in an ER schema diagram

