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**CMP\_SC 3380**

**Assignment 1**

**Rao**

Due date: Feb 7, 2024 (11:59 PM)

1. What is the difference between a database schema and a database state? (2 points)
   1. A database schema describes the structure of a database, types of data, and database constraints. This involves figuring out what entities and attributes need to be included in the database. Because you plan this out beforehand, the database schema is not supposed to change frequently. The database state, on the other hand, changes every time the database is updated. It represents the data stored within the database at any given time.
2. What is the difference between logical data independence and physical data independence? (3 points)
   1. Data independence is the ability to change one level of the database schema without affecting other levels. It is an advantage of three-schema architecture, and logical and physical data independence describe the data independence of specific levels of this architecture. Logical data architecture refers to the ability to change the conceptual schema level without having to change the external schema level, while physical data independence refers to the ability to change the internal schema level without having to change the conceptual schema level.
3. Below is a schema diagram from Chapter 2 of the textbook. In the STUDENT table, the Student\_number column must be unique (to prevent two different students from having the same Student\_number). Identify the column or the group of columns in the other tables that must be unique across all rows in the table. (5 points)

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* 1. COURSE: The combination of Department and Course\_number would be an option for the key (assuming Course\_number refers to the ‘1500’ part of ‘Math 1500’ and Department refers to the ‘Math’ part. Another option for the key would probably be the Course\_name as long as the course names are descriptive like Mizzou’s and there isn’t cross-leveled classes.

Going by the table on the slides, it would be Course\_number.

* 1. PREREQUISITE: Prerequisite\_number & Course\_number because one class might have multiple prerequisites and one prerequisite might be a prerequisite for more than one class.

EXAMLPES:

* + 1. Course\_name: Chemistry II Prerequisite: College Algebra
    2. Course\_name: Chemistry II Prerequisite: Chemistry I
    3. Course\_name: Calculus I Prerequisite: College Algebra
  1. SECTION: Section\_identifier & Course\_number
     1. There might be two classes with “Section A” and one class listed more than once for each section, so the key has to be the combination of the two.
     2. Going by the table on his slides, it would be Section\_identifier.
  2. GRADE\_REPORT: Student\_number & Section\_identifier

1. Composite and multivalued attributes can be nested to any number of levels. Suppose we want to design an attribute for a STUDENT entity type to keep track of previous college education. Such an attribute will have one entry for each college previously attended, and each such entry will be composed of college name, start and end dates, degree entries (degrees awarded at that college, if any), and transcript entries (courses completed at that college, if any). Each degree entry contains the degree name and the month and year the degree was awarded, and each transcript entry contains a course name, semester, year, and grade. Design an attribute to hold this information. Use the convention shown in the lecture slides. (5 points)

{PreviousCollege (CollegeName, StartDate, EndDate,

{DegreeName, MonthAwarded, YearAwarded},

{CourseName, Year, Semester, Grade}

}

A diagram of a student

Description automatically generated

1. Design **an initial ER model** for keeping track of information about votes taken in the U.S. House of Representatives during the current two-year congressional session. The database needs to keep track of each U.S. STATE’s Name (e.g., ‘Texas’, ‘New York’, ‘California’) and include the Region of the state (whose domain is {‘Northeast’, ‘Midwest’, ‘Southeast’, ‘Southwest’, ‘West’}). Each CONGRESS\_PERSON in the House of Representatives is described by his or her Name, plus the District represented, the Start\_date when the congressperson was first elected, and the political Party to which he or she belongs (whose domain is {‘Republican’, ‘Democrat’, ‘Independent’, ‘Other’}). The database keeps track of each BILL (i.e., proposed law), including the Bill\_name, the Date\_of\_vote on the bill, whether the bill Passed\_or\_failed (whose domain is {‘Yes’, ‘No’}). Draw the entity types along with their attributes. Show the key attributes if any. State any assumptions that are made. Note that ‘domain’ indicates the set of values an attribute can take. (10 points)

A diagram of a company

Description automatically generated with medium confidence

Assumptions: No one has the same name and no congress person can represent more than one party.