SE305 Database System Technology

Assignment 3

Due: Oct 9, 2018

1. Write a Java function using JDBC metadata features that takes a ResultSet as an input parameter, and prints out the result in tabular form, with appropriate names as column headings.

2. Let R = (A, B, C) and let r1 and r2 both the relations on schema R. Given an expression in the domain relational calculus that is equivalent to each of the following:

   a. $\Pi_A(r_1)$

   b. $\sigma_{B=17}(r_1)$

   c. $r_1 \cup r_2$

   d. $r_1 \cap r_2$

   e. $r_1 - r_2$

   f. $\Pi_{A,B}(r_1) \bowtie \Pi_{B,C}(r_2)$

3. A database is being constructed to keep track of the teams and games of a sport league. A team has a number of players, not all of whom participate in each game. It is desired to keep track of the players participating in each game for each team, the positions they played in that games, and the result of the games. Try to design an ER schema diagram for this application, stating any assumption you make. Choose your favorite sport (soccer, baseball, football …)

4. Design an ER diagram for keeping track of information about votes taken in the U.S. House of Representatives during the two-year congressional session. The database needs to keep track of each U.S. state's Name (e.g. Texas, New York, California) and includes the region of the state (whose domain is {North East, Midwest, Southwest, West}). Each CONGRESSPERSON in the House of Representatives us described by their Name, and includes the District represented, the StartDate when they were first elected, and the political Party they belong to (whose domain is {Republican, Democrat, Independent, other}). The database keeps track of each BILL (i.e. proposed law), and includes the BillName, the DateOfVote on the bill, whether the bill PassedOrFailed (whose domain is {YES, NO}), and the sponsor (the congressperson(s) who sponsored – i.e., proposed – the bill). The database keeps track of how each congressperson voted on each bill (domain of vote attribute is {Yes, No, Abstain, Absent}). Draw an ER schema diagram for the above application. State clearly any assumption you make.

5. Write the following queries in relational algebra, using the university schema.
   a. Find the titles of courses in the Comp. Sci. department that have 3
      credits.
   b. Find the IDs of all students who were taught by an instructor named
      Einstein; make sure there are no duplicates in the result.
   c. Find the highest salary of any instructor.
   d. Find all instructors earning the highest salary (there may be more
      than one with the same salary).
   e. Find the enrollment of each section that was offered in Autumn 2009.
   f. Find the maximum enrollment, across all sections, in Autumn 2009.
   g. Find the sections that had the maximum enrollment in Autumn 2009

6. Let R = (A, B) and S = (A, C), and let r(R) and s(S) be relations. Write expressions in
   relational algebra for each of the following queries:
   a. $\{<a> \mid \exists\, b\, (<a, b> \in r \wedge b = 7)\}$
   b. $\{<a, b, c> \mid <a, b> \in r \wedge <a, c> \in s\}$
   c. $\{<a> \mid \exists\, c\, (<a, c> \in s \wedge \exists\, b1, b2\, (<a, b1> \in r \wedge <c, b2> \in r \wedge b1 > b2))\}$