

ENDSEM

1. Suppose polling data of recent parliamentary elections were to be recorded. Where we have a number of candidates from various political parties for various parliamentary seats. We decide to record data as following:

- For political parties: Name of party and name of projected Prime Minister.
- For parliamentary constituency(seat): Name, state, No of voters
- For candidate: Candidate name, value of assets declared
- As counting done, we record vote count for each candidate, votes casted and votes rejected in each constituency, and finally we record name of elected candidate for each constituency.

Note that a parliamentary constituency is area whose votes elect a MP(Member of Parliament). Also, one candidate belongs to only one party, but can fight election from multiple constituencies. Assume that constituency name and candidate names are unique.

- a) Draw ER Diagram for required database. Specify cardinality and participation constraints.
 - b) Produce minimal set of Function Dependencies for the proposed database.
2. Consider scenario where we want to create a database of our projects in this course, where students are required to do a project. For this purpose, assume that we have designed following relational schema.

Student(Student_ID, Name)

Project(PNo, Title, TA_ID, TA_Name, Team_Grade)

Project_Teams(PNO, Student_ID, Student_Grade)

Here, grades are awarded at the end of project. Team_Grade is given to each project based on overall work in the project; and Student_Grade is awarded to individual student based on their contribution. Grades are awarded on the scale of 0 to 10.

Assume that the student relation contains data of our class only.

I Using semantics of the attribute find out key(s) and normal form of each relation.

II Write down relational algebra expressions to answer following queries

- i. List students(ID, Name) who are not part of an project team.
- ii. Provide TA-wise list of all students(ID, Name) who are doing projects.
- iii. List students(ID, Name, Team_Grade, Student_Grade) whose individual grade is more than team grade.
- iv. List project teams (PNO, Title, TA_ID, TA_Name) where average of individual scores within a team is outside the range team_score +/- 0.5. For example, if Team_Grade is 8.0, and average of individual grades is less than 7.5 or more than 8.5 then it is outside of the range, and such projects teams are to be included in result.

3. Consider company schema given below, and write down relational algebra query expressions to answer following queries

EMPLOYEE(SSN, Name, DNO, SUPERSSN, Gender)

DEPARTMENT(DNO, DNAME, MGRSSN)

PROJECTS(PNO, PNAME, DNO)

WORKS_ON(SSN, PNO, HOURS)

- (a) List(ssn, name) of female managers(female employees who are manager of some department).
 - (b) List(dno, dname, manager_name) of Departments that are running more than 5 projects.
 - (c) List ssn, name of employees who supervise more than 5 employees.
 - (d) List ssn, name of employees who work more than 40 hours collectively on all projects s/he works.
4. Suppose you are given following relations and set of functional dependencies on them. You need to compute all possible keys for every relation. What is existing Normal Form of the relation and how? Using appropriate method, decompose(Lossless and FD preserving) the relations into BCNF if possible, and is not already.
- a) R(ABCD): $\{A, B\} \rightarrow \{C, D\}$; $\{B\} \rightarrow \{C\}$; $\{C\} \rightarrow \{D\}$;
 - b) R(ABCDEFGH): $\{A, D\} \rightarrow C$; $\{A, B, C\} \rightarrow E$; $A \rightarrow \{F, G\}$;
 - c) R(ABCD): $\{A, B\} \rightarrow D$; $\{A, C\} \rightarrow \{B, D\}$; $B \rightarrow C$;
 - d) R(ABCDE): $\{A\} \rightarrow \{B, C, D\}$; $B \rightarrow C$; $C \rightarrow E$;
 - e) R(ABCDE): $A \rightarrow B$; $\{B, C\} \rightarrow E$; $\{E, D\} \rightarrow A$;

“The goal is to turn data into information, and information into insight.”

Carly Fiorina

Answers