In-Semester Exam-I (Autumn'2017)

IT 214 Database Management Systems

Time: 90 minutes Max Points: 90

IMPORTANT NOTE:

1. Write answers neat and clean. Answers that are difficult to read may simply be discarded.
2. Answer all queries in order. If you want to defer answering a query, may move to next by leaving sufficient blank space. You may follow a strategy of not answering more than two queries on a page.
3. In all questions marks awarding strategy will be discrete (i.e., 0, half, and full marks).
4. You may have to pay penalty for lengthier solutions.

Consider following relation schema **Company**. Note that it is slightly modified over the one that we have been discussing in Lectures/Labs.

DEP(dno, dname, head_eno)
-- attribute **head_eno** is emp no of the head of the department and refers into EMP relation
EMP(eno, name, gender, category, salary, supervisor_eno, dno)
-- attribute **supervisor_eno** is emp no of the employee's supervisor and refers to **eno** of EMP itself.
-- attribute **cat** is employee category and has domain of {worker, manager, engineer, staff}
PROJ(pno, pname, dno)
-- attribute **dno** is FK referring into DEP relation
WORK_HOURS(eno, pno, hours_per_month)
-- Attributes **eno** and **pno** are FKs referring into EMP and PROJ respectively.

1. Suppose, we want to have a constraint on Database that an employee can be head of department of only one department. Provide SQL code fragment for accomplishing this. [5]

   head_eno UNIQUE

Write **expressions in in Relational Algebra** to answer following queries [Questions 2 to 7] (No marks will be awarded if answered in SQL) [6x10]

2. List (ENO, Name, DNO, SALARY) of all workers (that is employees that belong to worker category)

$$\pi_{eno,name,dno,salary}(\sigma_{s.category='worker'}(EMP))$$

3. List (ENO, Name, Salary) of all Female supervisors.

$$\pi_{s.eno,s.name,s.salary}(\sigma_{s.gender='F'}(EMP_e \overset{\bowtie}{\boxed{e.supervisor\_eno = s.eno}} EMP_s))$$

4. List departments (dname, head_name) where head of department is not a Manager (i.e. not belonging to manager category).

$$\pi_{dname,name}(\sigma_{category<>'manager'}(EMP \overset{\bowtie}{\boxed{eno = head\_eno}} DEP))$$

5. Compute Average salary for each category of employees.

$$result \leftarrow {}_{category}\mathcal{F}_{AVG(salary)}(EMP)$$

6. List employee (ENO) who work on all projects on which employee with ENO=123 works.

$$r1 \leftarrow \pi_{pno}(\sigma_{eno=123}(WORK\_HOURS))$$
$$r2 \leftarrow \pi_{eno,pno}(WORK\_HOURS)$$
$$r2 \leftarrow r2\ DIV\ r1$$

7. Suppose a person gets Rs. 100 extra on top of salary for each hour he works on a project. Compute Total Salary for all employees.

$$r1(eno, hours) \leftarrow {}_{eno}\mathcal{F}_{sum(hours\_per\_month)}(WORK\_HOURS)$$
$$result \leftarrow \pi_{eno,name,salary+hours*100}(r1\ RIGH\ JOIN\ EMP\ ON\ (r1.eno = emp.eno))$$

Note: There is an issue here: for employees who do not work on any project will get total salary as NULL. This is incorrect; they get 0 incentives and total salary should be same as salary. SQL does provide certain functions by which converts null to zero as shown following in postgres-sql. However, with the assumption that this can be implicit in algebra, we are accepting above as a correct answer.

SQL for your Information:
select ssn, fname, salary+coalesce(hrs,0)*100 from (select essn, sum(hours) as hrs from works_on group by essn) as r **RIGHT JOIN** employee as e on r.essn=e.ssn;

8. Study and understand following database requirement. You task is to draw ER Diagram for proposed database. Specify key attributes also along with attributes for all identified entities. Also specify Cardinality and Participation constraints.

   While marking this question, the question will be split into few components, and there will be discrete (0, half, and full) marking for each component.

   [25]

IBM organizes an annual event called The Great Mind Challenge (TGMC). A number of Teams from various institutes around the country participate in the event. There can be more than one team from an institute.

Every participating team has to register online at TGMC site www.tgmc.in. While registering teams are required to furnish following details- Team Name, Login ID, Password, and details of team members - ~~email id,~~ name, email, and contact number. Each Team has a faculty mentor from same institute. Mentor Details- Name, Designation, email, and contact number are also furnished on the time of registration. A faculty can be mentor for more than one team.

At the end of event Winner, Runner teams are declared. In addition appreciation to other top-10 teams is also given.

The objective of building this database is that the organizer is able to maintain records of all teams registered for the event and for there after math. Motivated with various statistical summaries, city and state of institute is also recorded.