



Assignment # 1

Subject: Database Systems -CS2005
Total Marks: 40

Post Date: 8/9/2023
Due Date: 20/9/2023

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Instructions to be strictly followed.

- For all questions involving SQL Queries:
 - o **Submit the SQL Scripts in a .txt file.**
- It should be obvious that submitting your work after the due date will result in zero points being awarded.
- Plagiarism (copying/cheating) and late submissions result in a zero mark.

Question #01: Write descriptive answers of the following:

Total Marks /6

- Why would you choose a database system instead of simply storing data in operating systems files? When would it make sense not to use a database system?
- What are the responsibilities of a DBA? If we assume that the DBA is never interested in running his/her own queries, does the DBA still need to understand query optimization? Why?
- Which of the following plays an important role in representing information about the real world in a database? Explain briefly.
 - o The data definition language.
 - o The data manipulation language.
 - o The buffer manager.
 - o The data model

Question #02:

Total Marks /12

The following relations keep track of university database information:

Student(snum: integer, sname: string, major: string, level: string, age: integer)

Class(name: string, meets_at: time, room: string, fid: integer)

Enrolled(snum: integer, cname: string)

Faculty(fid: integer, fname: string, deptid: integer)

The meaning of these relations is straightforward; for example, Enrolled has one record per student-class pair such that the student is enrolled in the class.

Write the following queries in SQL. No duplicates should be printed in any of the answers.

1. Find the names of all Juniors (level = JR) who are enrolled in a class taught by I. Teach.
2. Find the age of the oldest student who is either a History major or enrolled in a course taught by I. Teach.
3. Find the names of all classes that either meet in room R128 or have five or more students enrolled.
4. Find the names of all students who are enrolled in two classes that meet at the same time.
5. Find the names of faculty members who teach in every room in which some class is taught.
6. Find the names of faculty members for whom the combined enrollment of the courses that they teach is less than five.
7. Print the level and the average age of students for that level, for each level.
8. Print the level and the average age of students for that level, for all levels except JR.
9. For each faculty member that has taught classes only in room R128, print the faculty member's name and the total number of classes she or he has taught.
10. Find the names of students enrolled in the maximum number of classes.
11. Find the names of students not enrolled in any class.
12. For each age value that appears in Students, find the level value that appears most often. For example, if there are more FR level students aged 18 than SR, JR, or SO students aged 18, you should print the pair (18, FR)

Question #03:

Total Marks /12

The following relations keep track of airline flight information:

Flights(flno: integer, from: string, to: string, distance: integer,
departs: time, arrives: time, price: real)

Aircraft(aid: integer, aname: string, cruisingrange: integer)

Certified(eid: integer, aid: integer)

Employees(eid: integer, ename: string, salary: integer)

Note that the Employees relation describes pilots and other kinds of employees as well, every pilot is certified for some aircraft, and only pilots are certified to fly. Write each of the following queries in SQL.

1. Find the names of aircraft such that all pilots certified to operate them have salaries more than \$80,000.

2. For each pilot who is certified for more than three aircraft, find the e_id and the maximum cruising range of the aircraft for which she or he is certified.
3. Find the names of pilots whose salary is less than the price of the cheapest route from Los Angeles to Honolulu.
4. Find the names of pilots certified for some Boeing aircraft.
5. Find the aids of all aircraft that can be used on routes from Los Angeles to Chicago.
6. Identify the routes that can be piloted by every pilot who makes more than \$100,000.
7. A customer wants to travel from Madison to New York with no more than two changes of flight. List the choice of departure times from Madison if the customer wants to arrive in New York by 6 p.m.
8. Compute the difference between the average salary of a pilot and the average salary of all employees (including pilots).
9. Print the name and salary of every nonpilot whose salary is more than the average salary for pilots.
10. Print the names of employees who are certified only on aircrafts with cruising range longer than 1000 miles.
11. Print the names of employees who are certified only on aircrafts with cruising range longer than 1000 miles, but on at least two such aircrafts.
12. Print the names of employees who are certified only on aircrafts with cruising range longer than 1000 miles and who are certified on some Boeing aircraft.

Question #04:

Total Marks /10

Consider the following relational schema and briefly answer the questions that follow:

Emp(eid: integer, ename: string, age: integer, salary: real)

Works(eid: integer, did: integer, pct time: integer)

Dept(did: integer, budget: real, managerid: integer)

1. Define a table constraint on Emp that will ensure that every employee makes at least \$10,000.
2. Define a table constraint on Dept that will ensure that all managers have age > 30.
3. Define an assertion on Dept that will ensure that all managers have age > 30. Compare this assertion with the equivalent table constraint. Explain which is better.
4. Write SQL statements to delete all information about employees whose salaries exceed that of the manager of one or more departments that they work in. Be sure to ensure that all the relevant integrity constraints are satisfied after your Updates.