INFSCI 2710 Database Management, Fall 2024

Homework 1: Relational Algebra, SQL

80 pts

Due Date: 9/30 at the end of the day. Please submit a pdf to the Canvas assignment.

Preparations: We are using the same dataset we used in the lab, please download two files ("create db.sql" and "insert table.sql") from the lab. Run SQL queries from both files (make sure you run "create db" first).

Part 1

Consider the relational database that provided in the lab material (Underlines attributes in bold are the primary keys.) For each question in this section, you need to provide **relational algebra expression, the SQL query and the screen shot of the output from MySQL querying interface** (make sure it is properly formatted).

advisor (**s_ID**,i_ID)
classroom (**building, room_number**, capacity)
course (**course_id**, title, dept_name, credits)
department (**dept_name**, building, budget)
instructor (**ID**, name, dept_name, salary)
prereq(**course_id, prereq_id**)
section (**course_id, sec_id,semester,year**, building, room_number, time_slot_id)
student (**ID**, name, dept_name, tot_cred)
takes (**ID, course_id,sec_id,semester,year**,grade)
teaches (**ID, course_id,sec_id,semester,year**)
time_slot (**time_slot_id, day.start_hr, start_min**, end_hr, end_min)

Q1 [5 pt] find the names of all the instructors from Finance department

Q2 [5 pt] Find the names of courses in Biology department which have 4 credits

Q3 [5 pt] Display information about all courses whose name start with letter “I”.

Q4 [5 pt] Retrieve all course_id and title of all courses taken by the student with ID 12345

Q5 [10 pt] Find course_id and name of all courses that taught by instructor from history department.

Part 2

Consider another relational database for the following questions (All the answers should include **SQL queries and corresponding query results**)

Table: `products`

product_id	product_name	category	price
1	Laptop	Electronics	1000.00
2	Smartphone	Electronics	800.00
3	Headphones	Electronics	150.00
4	Refrigerator	Appliances	500.00
5	Washing Machine	Appliances	600.00

Table: `inventory`

product_id	quantity
1	8
2	15
3	5
4	20
5	7

Table: `sales`

sale_id	product_id	sale_date	units_sold	total_price
1	1	2023-09-01	2	2000.00
2	2	2023-09-05	5	4000.00

sale_id	product_id	sale_date	units_sold	total_price
3	3	2023-09-07	3	450.00
4	4	2023-09-09	1	500.00
5	5	2023-09-11	5	3000.00

Q6[10 pt] Write SQL DDL statements to create the above tables. Make sure that you capture the primary and foreign key constraints (if applicable), choose appropriate domain (data) type and constraints for each attribute.

Q7 [10 pt] Write an SQL query to find the names of products that have less than 10 units in inventory but have sold more than 5 units overall. Include the product name, units sold, and available quantity.

Q8 [10 pt] Write an SQL query to find all products in the Electronics category that have less than 10 units available in inventory, for this question, also provide corresponding Relational Algebra

Q9[20 pt] Consider the following relational algebra expression

$$\pi_{\text{product\_name,category,price}}(\sigma_{(\text{units\_sold} > \mathbf{0})}(\text{sales} \bowtie \text{products}) \bowtie (\sigma_{(\text{quantity} > \mathbf{5})}(\text{inventory}))$$

1) How many attributes will the result have?

2) Write in English what question the expression is trying to answer (e.g. describe what would be the result of the expression).

3) Translate the expressions into SQL and return the results.