

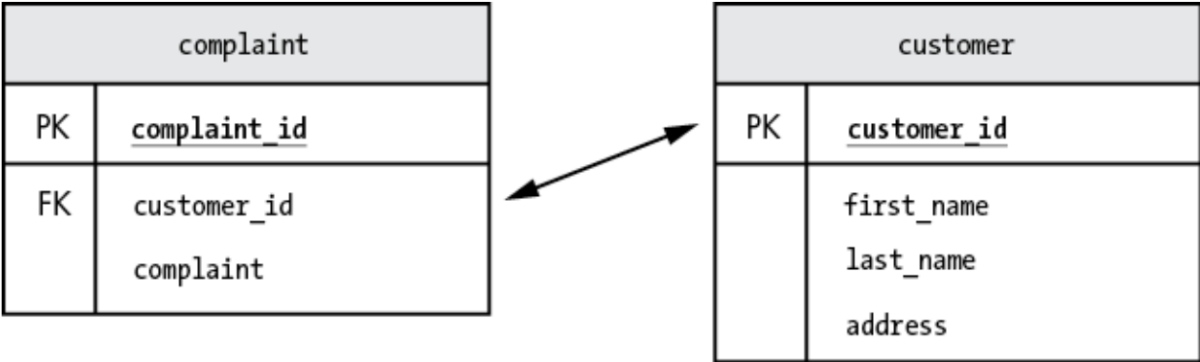
Midterm DB 2025

Instructions: Graduate students need to submit solutions to all the problems. Undergraduate students choose all but one problem.

Submit a pdf file with your solutions. For the SQL queries, provide well-formatted code. Also, give the first 20 results.

Problem 1:

Create the two tables shown below with primary keys and a named foreign key constraint. Choose appropriate data structures. The keys in both tables should be auto-incremented. Complaints can be several KBs. The address has as a default the empty string.



Problem 2:

Find the name of the employee that made the most money. Use a single SQL statement.

Problem 3:

Create a temporary table that contains the top-10 salaries. After defining this table, find the names of the employees who made one of the top-10 salaries. (There are only 4).

Problem 4:

Find the average salaries of people working in the various departments on January 6, 2021. Give the name of the department and the average salary as "Average Salary". Order by the average salary.

Problem 5:

Find the first and last name of all employees who were hired while Ingrid Koch was working at the company and that were in the same office. (Notice that departments have a single office). Make it into a single SQL query.

Problem 6:

(a) Explain why the table Person(Name, Birthday, Phone, Address, InsuranceCompName, InsuranceCompAddress) that contains information for an insurance broker is not in BCNF.

- (b) Given a table $R(A, B, C, D, E)$ with functional dependencies $A \rightarrow DE$; $BC \rightarrow A$; $D \rightarrow AE$, find all closures of subsets with one or two elements of the set of attributes. (Notice that $A \rightarrow BD$ is a short-cut for $A \rightarrow D$ and $A \rightarrow E$.)
- (c) Given the same dependencies, determine whether the decomposition into $R(A, C, D)$, $R(A, B, E)$ and $R(B, D)$ is lossless or given an example why it is not by applying the chase algorithm.