

COMP3013 2025 Fall

Assignment 3

Students are expected to submit two files.

- “COMP3013_25F_A3_XXX.sql”, where “XXX” is your student ID. This SQL file contains all the SQL queries for Q1. First line of the file should contain your name and ID as a comment. And question number for each question is also included as a comment. SQL comments are quoted by the sign /*...*/.
- “COMP3013_25F_A3_XXX.pdf”, for the rest of the questions.

Submissions which do not follow the guideline may **not be marked**.

Q1. The schema of a database is given as follows. Keys are underlined.

- student=(sID, sname, gender, age, gpa, pname)
// gender is either male or female.
- program=(pname, division)
// pname is the program name
- course=(cID, cname, pname, credit)
// credit is an integer and $1 \leq \text{credit} \leq 3$.
- enroll=(sID, cID, grade)
// grade is one of A, B, C, D, or F.

Write a query for each following question. (8 marks for each)

- Find the names of students who have enrolled all courses.
- Find the names of students who have enrolled some courses from every program.
- Find the names of students who have not received an “F” from any course.
- Find the name of the student who has enrolled more courses than other students.
- Create a constraint to guarantee the credit is in the correct range.

Q2. Given an instance of a relational schema $R = \{A, B, C\}$ and a list of functional dependencies.

A	B	C
a	α	T
a	β	T
a	γ	T
b	ε	F

Decide whether the functional dependencies are satisfied by the instance. (9 pt)

- | | | |
|-----------------------|-----------------------|-----------------------|
| a) $A \rightarrow B$ | b) $A \rightarrow C$ | c) $B \rightarrow A$ |
| d) $B \rightarrow C$ | e) $C \rightarrow A$ | f) $C \rightarrow B$ |
| g) $AB \rightarrow C$ | h) $AC \rightarrow B$ | i) $BC \rightarrow A$ |

Q3. Let A, B, C be three arbitrary attributes. Assume the functional dependency $AB \rightarrow C$ holds. Can we prove $A \rightarrow C$? If yes, then prove it by Armstrong's Axiom; if no, then disprove it by a counter example. (10pt)

Q4. Given a relational schema and a set of functional dependencies

- $R = \{A, B, C, D, E\}$
 - $F = \{AC \rightarrow B, BD \rightarrow C, CE \rightarrow D, DA \rightarrow E\}$
- a) Find all candidate keys of R . (6 pt)
 - b) Decompose R into BCNF. Show the steps. (15 pt)
 - c) Does the BCNF decomposition in part b) preserve all functional dependencies? Why? (5 pt)
 - d) Decompose R into 3NF. Show the steps. (15 pt)