

CSCI235 – Database Systems
2025 S2
Implementation Task 1
Due on 27 April 2025 by 9:00 pm Singapore time

Scope

The Implementation of Task 1 is related to the contents of topic on indexing.

This Implementation is due by Sunday, 27 April 2025, 9:00 pm Singapore time.
This task is worth 3% of the total assessment for the subject.

Only electronic submission through Moodle at:

<https://moodle.uowplatform.edu.au/>

is accepted. All email submission will be deleted and mark 0 (“zero”) will be awarded.

The submission procedure is explained at the end of this specification.

Specification

Task 1 (1.0 mark)

Consider the following description of a sample database domain.

A university plans to implement a database to store information about the campuses, lecturers working at the campuses, buildings located at the campuses, offices of lecturers within the buildings. A lecturer can work at more than one campus and at each campus he/she is assigned to one office. A campus is identified by a campus name. Lecturers have unique staff numbers. A building is described by a number which is unique within a campus. An office is described by a number which is unique within a building.

A database designer created the following relational schema.

UNI(campus-name, staff-number, building-number, office-number)

List **all** nontrivial functional dependencies you can find in a description of sample database domain give above.

Task 2 (1.0 mark)

Consider a relational schema $R(V, W, X, Y, Z)$ and the following set of functional dependencies valid in the schema:

- (i) $\{Z \rightarrow V, V \rightarrow W, X \rightarrow Y\}$

List **all** minimal keys valid in the schema. List all derivations of function dependencies that lead to the identification of minimal super keys. Note, a schema can have more than one minimal super key. **(0.3 mark)**

- (ii) $\{V \rightarrow W, W \rightarrow XY, X \rightarrow Z, Z \rightarrow VX\}$

List all minimal keys valid in the schema. List all derivations of function dependencies that lead to the identification of minimal super keys. Note, a schema can have more than one minimal super key. **(0.4 mark)**

- (iii) $\{V \rightarrow W, YW \rightarrow X\}$

List all minimal keys valid in the schema. List all derivations of function dependencies that lead to the identification of minimal super keys. Note, a schema can have more than one minimal super key. **(0.3 mark)**

Task 3 (1.0 mark)

Consider the relational schemas given below and the respective sets of functional dependencies valid in the schemas.

For each one of the relational schemas, determine the highest normal form, which is valid for a schema. **Justify your answer.** Justification must include the derivations of minimal keys from the functional dependencies and testing the validity of all normal forms (2NF, 3NF, BCNF) against the relational schemas, minimal keys, and functional dependencies.

If a schema is not in BCNF, then decompose it into a *minimum number of schemas* so that each one of them is in BCNF. **Justify your answer.**

A correct guess without the comprehensive justifications scores no marks!

- (i) PLAYER(pnum, team, name, position, address)
pnum \rightarrow team, name, position, address
team \rightarrow address
- (ii) ROOM(bnum, rnum, area, type)
bnum, rnum \rightarrow area, type
rnum \rightarrow area, type
- (iii) CONNECTION(bnum, rnum, ip)
bnum, rnum \rightarrow ip
ip \rightarrow rnum
- (iv) COURSE (student#, course#, lecturer, department)
course#, student# \rightarrow lecturer
course#, student# \rightarrow department
lecturer \rightarrow course
- (v) Product (s#, city, p#, quantity, status)
s# \rightarrow city
s# \rightarrow status
city \rightarrow status
s#, p# \rightarrow quantity
s#, p# \rightarrow city
s#, p# \rightarrow status

Deliverables

A file solution.pdf that contains solutions for the Implementation Task 1 specified above.

Submissions

This assignment is due by 9:00 pm (21:00 hours) Sunday, 27 April 2025, Singapore time.

Submit the files **IT1SolutionOutput.txt** through Moodle in the following way:

- 1) Access Moodle at **<http://moodle.uowplatform.edu.au/>**
- 2) To login use a Login link located in the right upper corner the Web page or in the middle of the bottom of the Web page
- 3) When successfully logged in, select a site CSCI235 (SP225) Database Systems
- 4) Scroll down to the section "Implementation Task 1 Submission link", and click at the link.
- 5) Click at a button Add Submission
- 6) Move the file that you want to submit into an area of submission. If you have more than one files to submit, you can drag and drop the remaining files here to add them. You can also use a link *Add...*
- 7) Click at the button "Save changes",
- 8) Click at the check box to confirm authorship of your submission and click at the button "Continue".
- 9) When you are satisfied, remember to click at a button Submit assignment.

A policy regarding late submissions is included in the subject outline. Only one submission per student is accepted.

Implementation Task 1 is an individual assignment, and it is expected that all its tasks will be solved individually without any cooperation with the other students. Plagiarism is treated seriously. Students involved will likely receive zero. If you have any doubts, questions, etc. please consult your lecturer or tutor during lab classes or over e-mail.