COMP3013 2024 Fall

Assignment 3

For the submission, please pack all files and convert them into **A** **SINGLE PDF FILE**. Rename the PDF file as COMP3013\_24F\_A3\_XXXX, where XXXX is your student ID.

The schema of a database for public transportation companies is as follows. Keys are underlined.



// is a foreign key to .



// is a foreign key to .

// is a foreign key to .

// is a foreign key to .

// is a foreign key to .

// is a foreign key to .

// is a foreign key to .

Q1. Write a query for each following question. (10pt for each)

1. Find the ID of routes which are not served by any vehicle. You must use subqueries.
2. Find the name of drivers who have served the route 69 (rID). You must use subqueries.
3. Find the name of drivers who have driven all vehicles.
4. Find the plate number of vehicles which have served all route operated by “Xinhe” (company name).
5. Implement constraints to guarantee the gender of a driver is either “Male” or “Female” and the age is from 20 to 60.

Q2. Given an instance of a relational schema and a list of functional dependencies.

|  |  |  |
| --- | --- | --- |
|  |  |  |
| 1 | 2 | 2 |
| 1 | 3 | 2 |
| 1 | 4 | 2 |
| 2 | 5 | 2 |

Decide whether the functional dependency is satisfied by the instance. (10 pt)

a) b) c)

d) e) f)

g) h) i)

Q3. Given a relational schema and a set of functional dependencies

1. Find all candidate keys of . (6 pt)
2. Decompose into BCNF. Show the steps. (15 pt)
3. Does the BCNF decomposition in part b) preserve all functional dependencies? (4 pt)
4. Decompose into 3NF. Show the steps. (15 pt)