Assignment 2 (1DT903) Functional Dependencies, Normalization, and SQL

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Description
In this assignment, you will perform functional dependencies and normalization and use SQL language to create queries for the databases. You will also use MySQL workbench to load the database and execute SQL queries.

Submission
Your submission should include solutions to all tasks presented in this assignment using the provided template. Submit a report in **PDF format** on Moodle and SQL queries in a script **.sql** file on Moodle.

Software: MySQL Server, MySQL Workbench

Study materials: Lecture 4 and Lecture 5

Task 1 SQL queries using MySQL Workbench DBMS (60 points)

1.1 Create SQL schema for the Company database in MySQL Workbench.

1.2 Import "company_schema.sql" file (attached in moodle together with this assignment) to MySQL Workbench and execute the SQL statements written in "company_schema.sql" file.

1.3 Import comany_data.sql (attached in moodle together with this assignment) file (which automatically will populate the company database). In case some of the rows were entered with wrong values, use the UPDATE command to correct the values.

1.4 Use basic queries in SQL to retrieve the following information (***report the SQL query as text and output/results of the query as screenshot in the PDF report***):

1. Find the names of all employees who are working on the two project "Middleware" and "DatabaseSystems"
2. Find the names of all employees who are working on the project DatabaseSystems and have worked more than 40 hours.
3. For every project located in Houston, list the project number, the controlling department number, and the department manager's last name, address, and birth date.
4. For each employee, retrieve the employee's first and last name and the first and last name of his or her supervisor.

5. Retrieve male employees whose address is in Houston, TX (use Pattern Matching LIKE operator)
6. Find all employees who were born in August month (use MONTH operator)
7. For each department, retrieve the department name and the average salary of all employees working in that department.
8. Retrieve the names of employees who are not assigned any project.
9. Retrieve the names of all employees in department 5 who earn more than 30000 and work on ProductZ project
10. List the names of all employees who are from 'Houston,TX', and work under the manager's personal number '333445555'
11. Retrieve the names of employees who work in the department that has the employees with the highest salary among all departments (Use nested queries and AVG(salary) in the department)
12. For each department whose average employee salary is more than 35 000, retrieve the department number, name, and the number of employees working for that department.
13. Retrieve the names (ordered alphabetically), and the relationship of dependents whose employee's supervisor has '333445555' for Snn.
14. For every project, list the project name, and the total amount of hours worked on each project, and the total amount of employees worked on each project.
15. For every department list the department name, number of projects, and number of employees
16. For each department manager, list the number of projects he/she is working on
17. For each department manager, list the number of employees working in their department.

1.5 Export all queries into one script file (.sql) in MySQL Workbench and submit it to Moodle together with your PDF report.

Task 2 Functional Dependencies and Normalization (40 points)

2.1 Consider the relation (table) below, which represents information on the course schedule at a university. The following are given: the course number (Course), the department, a head of the department, number of credits, course level, the tutor identifier (TutoId), semester, year, days with times, and number of students.

Course	Department	HeadOfDep	Credits	Course_level	TutorId	Semester	Year	Days	Students
1DV503	Computer Science	Jonas	7,5	Bachelor	7657894	VT	2024	Tue, 10:00-12:00	35
1DT506	Computer Science	Jonas	5	Bachelor	7657894	VT	2024	Wed,10:00-12:00	60
4DV305	Math	Anna	7,5	Master	4536783	VT	2023	Mon, 10:00-12:00	25
2DV314	Math	Anna	10	Bachelor	7000000	HT	2024	Mon,10:00-12:00	45
1DV503	Computer Science	Jonas	7,5	Bachelor	7657894	VT	2024	Thu,13:00-14:00	60
4DV305	Math	Anna	7,5	Master	4536783	HT	2023	Mon, 13:00-14:00	30
4DV305	Math	Anna	7,5	Master	5634125	VT	2023	Fri, 10:00-12:00	25
1DV503	Computer Science	Jonas	7,5	Bachelor	7657845	HT	2024	Tue, 10:00-12:00	80
2DV314	Math	Anna	10	Bachelor	7000000	HT	2024	Fri,10:00-12:00	45
2DV314	Math	Anna	5	Bachelor	1111111	VT	2024	Tue, 10:00-12:00	30

Identify the functional dependencies, a possible candidate key, and redundancies of the information stored in such a table (**10 points**).

2.2 Consider the table in 2.1 with the following operations (**10 points**):
- Insertion of a new course.
- Deletion of a course.
- Addition of a teaching days in a course
- Changing the head of the department.

Describe with examples the types of anomaly that can be caused by these operations.

2.3 Consider the relation in 2.1 again with the described redundancies and anomalies in 2.2 and decompose this relation to 3NF that removes these anomalies and redundancies. Show the final tables obtained with their corresponding primary keys. Then verify that it is possible to reconstruct the original table given in 2.1 using your 3NF decomposition (**20 points**).