

Assignment 2 (1DV503). 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** 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 to MySQL Workbench and execute the SQL statements written in company_schema.sql file.

1.3 Import company_data.sql 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 female employees whose address is in Houston, TX (use Pattern Matching LIKE operator)

6. Find all employees who were born in June 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 7 who earn more than 30000 and work on LaserPrinters 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.

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 (15 points)

2.1 Looking at the table below, define (5 points) :

1. A primary key
2. All functional dependencies between attributes

EMPLOYEE_ID	NAME	JOB_ID	JOB_TITLE	POST_CODE	CITY
E01	Peter	J01	Chef	232 91	Malmö
E01	Peter	J02	Waiter	232 91	Malmö
E02	Natali	J02	Waiter	350 02	Växjö
E02	Natali	J03	Bartender	350 02	Växjö
E03	Johanna	J01	Chef	107 90	Stockholm

2.2 The table below represents information about some products and the parts needed to assemble each product. Each product consists of parts (Part), where each part is described by type (Type), quantity, price, and supplier. Each Product is described by material and price.

Product	Part	Material	Type	Quantity	Product_Price	Part_Price	Part_Supplier
Table	Screw	Metal	K123	100	1000	25	Metal AB
Table	Legs	Wood	Oak	4	1000	115	Quality Woods
Table	Apron	Wood	Maple	2	1000	80	Quality Woods
Chair	Screw	Metal	K123	10	500	25	Metal AB
Chair	Joints	Metal	J456	4	500	80	Metal AB
Chair	Legs	Wood	Pine	4	500	50	Quality Woods
Shelf	Screw	Metal	H567	4	200	25	MIAK AB
Shelf	Wood	Wood	Oak	1	200	100	IKAI AB

Identify (10 points):

1. The primary key
2. The functional dependencies of the corresponding application.

3. Identify and show possible redundancies and anomalies (update, deletion, insertion). Justify your answer.

Task 3 Normalization (25 points)

3.1 Consider the relation given in 2.3 with described redundancies and anomalies decompose this relation to 3NF and check that all defined anomalies and redundancies are resolved. Present the final relations (tables) in 3NF form with their corresponding primary keys. *(10 points)*

3.2 Consider the following relation *(15 points)*:

CAR_SALE (Car, Date_sold, Salesperson, Commission, Discount)

Assume that a car may be sold by multiple salespeople, and hence {Car, Salesperson} is the primary key. Additionally, dependencies are:

Date_sold \rightarrow Discount, for example, on date 8th March is REA all cars with 15% discount

Salesperson \rightarrow Commission, for example, a salesperson receives a 10% commission on every sold car.

1. Based on the given primary key, is this relation in 1NF, 2ND, or 3NF? Justify your answer.
2. Perform normalization to 3NF with an explanation. Provide the final result with all tables in 3NF.