CS33503数据库系统实验

实验检查记录

|  |  |  |  |
| --- | --- | --- | --- |
| 实验结果的正确性(60%) |  | 表达能力(10%) |  |
| 实验过程的规范性(10%) |  | 实验报告(20%) |  |
| 加分(5%) |  | 总成绩(100%) |  |

实验报告

一、实验目的

|  |
| --- |
| 1. 掌握一种关系数据库管理系统(RDBMS)的使用方法。 2. 学会使用SQL创建、修改、查询和控制关系数据库。 |

二、实验环境

|  |
| --- |
| **硬件设备：**Intel(R) Core(TM) i7-9750H CPU @ 2.60GHz 2.59 GHz  **软件系统：**Windows 11 22H2、Ubuntu 20.04.4 LTS、MySQL Server version: 8.0.28-0ubuntu0.20.04.3  **开发工具：**Visual Studio Code 1.65.2 |

三、实验过程

|  |
| --- |
| **实验过程及实现方法：**   1. 练习SQL命令。    1. 显示数据库列表：SHOW DATABASES;    2. 选择创建的数据库Product：USE Product;    3. 显示所有的表名字：SHOW TABLES;    4. 显示数据表PC的结构：DESCRIBE PC;    5. 清空PC表中记录：DELETE FROM PC;    6. 创建数据库college：CREATE DATABASE college;    7. 删除数据库college：DROP DATABASE college; 2. 用SQL编写本课程第3章习题11中的全部数据库查询和更新语句。    1. Find the manufacturers that sell laptops but not PC’s. (使用集合差运算)：(SELECT DISTINCT maker FROM Product WHERE type = 'laptop') MINUS (SELECT DISTINCT maker FROM Product WHERE type = 'pc');    2. Find the manufacturers that sell laptops but not PC’s. (使用含有IN的嵌套查询)：SELECT DISTINCT maker FROM Product WHERE type = 'laptop' AND maker NOT IN (SELECT DISTINCT maker FROM Product WHERE type = 'pc');    3. Find the manufacturers that sell laptops but not PC’s. (使用含有EXISTS的嵌套查询)：SELECT DISTINCT maker FROM Product AS S WHERE type = 'laptop' AND NOT EXISTS (SELECT \* FROM Product AS T WHERE T.type = 'pc' AND S.maker = T.maker);    4. Find the model numbers of all printers that are cheaper than the printer model 3002. (使用内连接查询)：SELECT P1.model FROM Printer AS P1 JOIN Printer AS P2 on (P1.price < P2.price) AND P2.model = '3002';    5. Find the model numbers of all printers that are cheaper than the printer model 3002. (使用含有比较运算符的嵌套查询)：SELECT model FROM Printer WHERE price < (SELECT price FROM Printer WHERE model = '3002');    6. Find the model numbers of all printers that are cheaper than the printer model 3002. (使用含有EXISTS的嵌套查询)：SELECT model FROM Printer AS P1 WHERE EXISTS (SELECT \* FROM Printer AS P2 WHERE P2.model = '3002' AND P1.price < P2.price);    7. Find the PC model with the highest available speed. (使用外连接查询)：SELECT DISTINCT P1.model FROM PC AS P1 LEFT JOIN PC AS P2 ON P1.speed < P2.speed WHERE P2.model is NULL;    8. Find the PC model with the highest available speed. (使用含有IN的嵌套查询)：SELECT model FROM PC WHERE speed IN (SELECT MAX(speed) FROM PC);    9. Find the PC model with the highest available speed. (使用含有=的嵌套查询)：SELECT model FROM PC WHERE speed = (SELECT MAX(speed) FROM PC);    10. Find the PC model with the highest available speed. (使用含有>=的嵌套查询)：SELECT model FROM PC WHERE speed >= ALL (SELECT speed FROM PC);    11. Find the PC model with the highest available speed. (使用含有EXISTS的嵌套查询)：SELECT model FROM PC AS P1 WHERE NOT EXISTS (SELECT \* FROM PC AS P2 WHERE P2.speed > P1.speed);    12. Find the manufacturers of PC’s with at least three different speeds. (使用内连接查询)：SELECT DISTINCT P1.maker FROM ((Product AS P1 NATURAL JOIN PC AS PC1) JOIN (Product AS P2 NATURAL JOIN PC AS PC2) ON (P1.maker = P2.maker) JOIN (Product AS P3 NATURAL JOIN PC AS PC3) ON (P1.maker = P3.maker)) WHERE PC1.speed != PC2.speed AND PC1.speed != PC3.speed AND PC2.speed != PC3.speed;    13. Find the manufacturers of PC’s with at least three different speeds. (使用分组查询)：SELECT maker FROM Product NATURAL JOIN PC GROUP BY maker HAVING COUNT(DISTINCT speed) >= 3;    14. Find the manufacturers of PC’s with at least three different speeds. (使用派生关系)：SELECT maker FROM (SELECT maker, COUNT(DISTINCT speed) AS c FROM Product NATURAL JOIN PC GROUP BY maker) AS P WHERE P.c >= 3;    15. Decrease the price of all PC’s made by maker A by 10%. (使用含有=的更新条件)：UPDATE PC SET price = price \* 0.9 WHERE 'A' = (SELECT maker FROM Product WHERE PC.model = Product.model);    16. Decrease the price of all PC’s made by maker A by 10%. (使用含有IN的更新条件)：UPDATE PC SET price = price \* 0.9 WHERE model IN (SELECT model FROM Product WHERE maker = 'A');    17. Decrease the price of all PC’s made by maker A by 10%. (使用含有EXISTS的更新条件)：UPDATE PC AS P1 SET price = price \* 0.9 WHERE EXISTS (SELECT \* FROM Product AS P2 WHERE P1.model = P2.model AND P2.maker = 'A');    18. 从SQL语句的易读性和执行效率两方面对题目(g)–(k)的SQL语句进行分析和比较。 （分析结果在“实验结果”部分）   **实验结果：**   1. 练习SQL命令。    1. 显示数据库列表：      * 1. 选择数据库Product：      * 1. 显示所有的表名字：      * 1. 显示数据表PC的结构：      * 1. 清空PC表中记录：      * 1. 创建数据库college：      * 1. 删除数据库college：      1. 本课程第3章习题11中的全部数据库查询和更新语句执行结果。   a)-c) Find the manufacturers that sell laptops but not PC’s. （由于MySQL限制，无法展示使用MINUS的语句)    d)-f) Find the model numbers of all printers that are cheaper than the printer model 3002.    g)-k) Find the PC model with the highest available speed.      l)-n) Find the manufacturers of PC’s with at least three different speeds.      o)-q) Decrease the price of all PC’s made by maker A by 10%. （每个命令执行完之后会将价格复原）        r)对(g)–(k)的SQL语句进行分析和比较：  易读性：(i)的易读性最好，(h)和(j)的易读性相对较差，(g)和(k)的易读性在5个SQL语句中最差。  执行效率：由于(h)和(i)只需要对PC表扫描2次，与其他的语句效率相比较高；而因为在speed上没有索引，所以(g)、(j)和(k)的效率较差。 |

四、实验结论

|  |
| --- |
| 通过本次实验，我对于关系数据库管理系统MySQL的使用方法有了更加深刻的掌握，也学会了通过不同的语句来创建、修改、查询和控制关系数据库，体会到了数据库的方便与魅力。 |