

**数据库系统**

**实 验 报 告**

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| 计分项 | 出勤 | 程序验收 | 实验报告 | 综合 |
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**2021-04**

**数据库系统 实验报告**

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| 任课教师 | | 王金宝 | | | 指导教师 | 王金宝 | |
| 实验地点 | | 研究院二楼 | | | 实验时间 | 2021年 4 月 24 日 | |
| 实验名称 | | 实验一：关系数据库管理系统及SQL语言的使用 | | | | | |
| 实验环境 | | 阿里云开放实验室提供的RDS-MySQL或者PolarDB-MySQL。 | | | | | |
| 实验目标 | | | | | | | |
| 掌握关系数据库管理系统的基本命令，并熟练使用SQL语言管理数据库（阿里云数据库RDS-MySQL或者PolarDB-MySQL）。掌握SQL语言的使用方法，学会使用SQL语言进行关系数据库查询，特别是聚集查询、连接查询和嵌套查询。 | | | | | | | |
| 实验内容（实验过程和相应的实验结果展示） | | | | | | | |
| **创建关系数据库COMPANY，使用SQL语言完成如下查询：**  1：参加了项目名为“SQL Project”的员工名字；  SELECT ENAME  FROM `employee` WHERE ESSN IN  ( SELECT ESSN  FROM `works\_on` WHERE PNO IN  ( SELECT PNO  FROM `project` WHERE PNAME = 'SQL Project'));  2：在“Research Department”工作且工资低于3000元的员工名字和地址；  SELECT ENAME,ADDRESS  FROM `e2\_employee`  WHERE SALARY < 3000 AND  DNO IN (  SELECT DNO  FROM `e2\_department` WHERE  DNAME = 'Research Department') ;  3：没有参加项目编号为P1的项目的员工姓名；  SELECT ENAME  FROM `e2\_employee`  WHERE ESSN NOT IN  ( SELECT ESSN FROM `e2\_works\_on` WHERE  PNO = 'P1');  4：由张红领导的工作人员的姓名和所在部门的名字；  SELECT ENAME, DNAME FROM `e2\_employee` JOIN `e2\_department` USING(DNO)  WHERE `ESSN` IN( SELECT `ESSN` FROM `e2\_works\_on` WHERE `PNO` IN  ( SELECT `PNO` FROM `e2\_project` WHERE `DNO` IN  ( SELECT `DNO` FROM `e2\_department` WHERE `MGRSSN` IN  ( SELECT `ESSN` FROM `e2\_employee` WHERE `ENAME` = "张红"))));  5：至少参加了项目编号为P1和P2的项目的员工号；  SELECT ESSN  FROM `e2\_works\_on` WHERE PNO = 'P1'  AND ESSN IN  ( SELECT ESSN  FROM `e2\_works\_on` WHERE PNO = 'P2'  );  6：参加了全部项目的员工号码和姓名；  SELECT ESSN, ENAME  FROM `e2\_employee` WHERE  NOT EXISTS  ( SELECT PNO  FROM `e2\_project` WHERE NOT EXISTS  ( SELECT \* FROM `e2\_works\_on` WHERE `e2\_employee`.ESSN = `e2\_works\_on`.ESSN  AND `e2\_project`.PNO = `e2\_works\_on`.PNO  ));  7：员工平均工资低于3000元的部门名称；  SELECT DNAME  FROM `e2\_department` JOIN `e2\_employee` ON (`e2\_department`.DNO = `e2\_employee`.DNO)  GROUP BY DNAME  HAVING 3000 >= avg(SALARY);  8：至少参与了3个项目且每周项目工作总时间不少于20小时的员工名字；  SELECT ENAME  FROM `e2\_employee`  WHERE ESSN IN  ( SELECT ESSN  FROM `e2\_works\_on` WHERE `e2\_employee`.ESSN = `e2\_works\_on`.ESSN  GROUP BY ESSN  HAVING COUNT( \*) >3  AND SUM(HOURS\_PER\_WEEK) >=20  );  9：假设每个员工每周工作40个小时，查询每个部门的员工小时平均工资；  SELECT avg(SALARY)/40 SALARY\_PER\_HOURS  FROM `e2\_employee`  GROUP BY DNO;  10：参加了由张红领导的部门所属的全部项目的员工姓名；  SELECT ENAME  FROM `e2\_employee` A  WHERE NOT EXISTS  ( SELECT PNO  FROM `e2\_project` B  WHERE DNO IN (  SELECT DNO  FROM `e2\_department` WHERE MGRSSN IN  ( SELECT ESSN FROM `e2\_employee` WHERE ENAME = '张红'  ))  AND NOT EXISTS  ( SELECT \*  FROM `e2\_works\_on` WHERE  A.ESSN = `e2\_works\_on`.ESSN  AND B.PNO = `e2\_works\_on`.PNO  )  );  11：没有参加过任何由张红领导的部门所属项目的员工姓名；  SELECT ENAME  FROM `e2\_employee` A  WHERE NOT EXISTS  ( SELECT PNO  FROM `e2\_project` B  WHERE DNO IN (  SELECT DNO  FROM `e2\_department` WHERE MGRSSN IN  ( SELECT ESSN FROM `e2\_employee` WHERE ENAME = '张红'  ))  AND EXISTS  ( SELECT \*  FROM `e2\_works\_on` WHERE  A.ESSN = `e2\_works\_on`.ESSN  AND B.PNO = `e2\_works\_on`.PNO  )  );  12：领导项目数量最多的部门负责人姓名；  SELECT ENAME  FROM `e2\_employee`  WHERE ESSN IN  ( SELECT MGRSSN  FROM `e2\_department`  WHERE DNO IN (  SELECT DNO  FROM `e2\_project`  WHERE `e2\_project`.DNO = `e2\_department`.DNO  GROUP BY DNO  HAVING COUNT( `e2\_project`.PNO) >= ALL (  SELECT COUNT( \*)  FROM `e2\_project`  GROUP BY DNO ))  );  13：参与项目最多的员工的姓名；  SELECT ENAME  FROM `e2\_employee`  WHERE ESSN IN  ( SELECT ESSN  FROM `e2\_works\_on`  WHERE `e2\_employee`.ESSN = `e2\_works\_on`.ESSN  GROUP BY ESSN  HAVING COUNT(\*) >= ALL (  SELECT COUNT( \*)  FROM `e2\_works\_on`  GROUP BY ESSN ));  14：工资总数最高的部门信息；  SELECT \*  FROM `department`  WHERE DNO IN  ( SELECT DNO  FROM `employee`  WHERE `employee`.DNO = `department`.DNO  GROUP BY DNO  HAVING SUM(SALARY) >= ALL (  SELECT SUM(SALARY)  FROM `employee`  GROUP BY DNO ));  15：假设每个员工每周工作40个小时，查询每个项目一周的人工费用；  SELECT PNO,(avg(SALARY)/40)\* SUM( `HOURS\_PER\_WEEK`) SALARY\_PER\_WEEK  FROM `employee` JOIN `works\_on` ON ( `employee`.ESSN = `works\_on`.ESSN)  GROUP BY PNO;  **创建触发器，完成以下功能：**  1：修改WORKS\_ON中每周工作时间后，检查员工每周工作总时长是否超过40小时，如果是，则撤销修改；      2：插入新的员工后，如果员工的直接领导信息为空而且员工已分配至某部门，则将员工所属部门的领导作为员工的直接领导；    创建视图，完成以下功能：   1. 为张红创建她所属部门的员工信息视图EMPLOYEE\_ZHONGHONG；   select `e2\_employee`.`ENAME` AS `ENAME`,`e2\_employee`.`ESSN` AS `ESSN`,`e2\_employee`.`ADDRESS` AS `ADDRESS`,`e2\_employee`.`SALARY` AS `SALARY`,`e2\_employee`.`SUPERSSN` AS `SUPERSSN`,`e2\_employee`.`DNO` AS `DNO` from `e2\_employee` where (`e2\_employee`.`SUPERSSN` = (select `e2\_employee`.`ESSN` from `e2\_employee` where (`e2\_employee`.`ENAME` = '张红')))    2）在EMPLOYEE\_ZHONGHONG中查询工资超过4000的员工信息；  SELECT \* FROM `employee\_zhonghong`  WHERE SALARY> 4000 | | | | | | | |
| 实验结论（结果分析、遇到的困难和解决方法等） | | | | | | 备注 |  |
| 建立触发器进行操作时，触发器可以进行几个表之间的嵌套操作，使插入、更新等操作符合用户需求，省去管理员在多表之间操作。 | | | | | | | |

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| 实验地点 | | 研究院二楼 | | | 实验时间 | 2021年 5月 8日 | |
| 实验名称 | | 实验二：使用高级语言操纵阿里云数据库 | | | | | |
| 实验环境 | | 阿里云数据库、Java、C++等 | | | | | |
| 实验目标 | | | | | | | |
| 学会使用高级语言访问阿里云数据库数据库，并进行查询。 | | | | | | | |
| 实验内容（实验过程和相应的实验结果展示） | | | | | | | |
| ***1.***  ***Scanner in = new Scanner(System.in); System.out.println("请输入你要查询的参加项目号员工的项目号："); String PNO = in.nextLine(); PreparedStatement ps1 = connection.prepareStatement("SELECT ENAME FROM `employee`\n" +  "WHERE ESSN IN \n" +  "(SELECT ESSN FROM `works\_on` WHERE PNO = ?);"); ps1.setString(1,PNO); resultSet = ps1.executeQuery(); while (resultSet.next()) {  // 输出courses表中的name字段  System.out.println(resultSet.getString("ENAME"));***  图1 图2  ***2.***  ***Scanner in = new Scanner(System.in); System.out.println("请输入你要查询的参加项目员工的项目名："); String PNAME = in.nextLine(); PreparedStatement ps2 = connection.prepareStatement("SELECT ENAME FROM `employee`" +  "WHERE ESSN IN \n" +  "(SELECT ESSN FROM `works\_on` WHERE `PNO` IN ( SELECT `PNO` FROM `project` WHERE `PNAME` = ?));"); ps2.setString(1,PNAME); resultSet = ps2.executeQuery(); while (resultSet.next()) {  // 输出courses表中的name字段  System.out.println(resultSet.getString("ENAME")); }***  ***3.***  ***Scanner in = new Scanner(System.in); System.out.println("请输入你要查询的在部门工作的部门名："); String DNAME = in.nextLine(); PreparedStatement ps3 = connection.prepareStatement("SELECT ENAME, ADDRESS FROM `employee` WHERE `DNO` IN \n" +  "( SELECT `DNO` FROM `department` WHERE `DNAME` = ?);\n"); ps3.setString(1,DNAME); resultSet = ps3.executeQuery(); while (resultSet.next()) {  // 输出courses表中的name字段  System.out.println(resultSet.getString("ENAME"));  System.out.println(resultSet.getString("ADDRESS")); }***  图3  图4  ***4.***  ***Scanner in = new Scanner(System.in); System.out.println("请输入你要查询的在部门工作的部门名："); String DNAME = in.nextLine(); System.out.println("请输入你要查询者工资的上限："); int SALARY = in.nextInt(); PreparedStatement ps4 = connection.prepareStatement("SELECT ENAME, ADDRESS FROM `employee` WHERE `DNO` IN \n" +  "( SELECT `DNO` FROM `department` WHERE `DNAME` = ? AND `SALARY` < ? );\n"); ps4.setString(1,DNAME); ps4.setInt(2,SALARY); resultSet = ps4.executeQuery(); while (resultSet.next()) {  // 输出courses表中的name字段  System.out.println(resultSet.getString("ENAME"));  System.out.println(resultSet.getString("ADDRESS")); }***  ***5.***  ***Scanner in = new Scanner(System.in); System.out.println("请输入你要查询的不在项目工作员工的项目名："); String PNO = in.nextLine(); PreparedStatement ps5 = connection.prepareStatement("SELECT ENAME FROM `employee` \n" +  "WHERE `ESSN` NOT IN \n" +  "( SELECT `ESSN` FROM `works\_on` WHERE `PNO` = ?);"); ps5.setString(1,PNO); resultSet = ps5.executeQuery(); while (resultSet.next()) {  // 输出courses表中的name字段  System.out.println(resultSet.getString("ENAME")); }***  图5  图6  ***6.***  ***Scanner in = new Scanner(System.in); System.out.println("请输入你要查询的领导工作员工的领导名："); String ENAME = in.nextLine(); PreparedStatement ps6 = connection.prepareStatement("SELECT ENAME, DNAME FROM `employee` JOIN `department` USING(DNO)\n" +  "WHERE `ESSN` IN( SELECT `ESSN` FROM `works\_on` WHERE `PNO` IN \n" +  " ( SELECT `PNO` FROM `project` WHERE `DNO` IN \n" +  " ( SELECT `DNO` FROM `department` WHERE `MGRSSN` IN \n" +  " ( SELECT `ESSN` FROM `employee` WHERE `ENAME` = ?)))); "); ps6.setString(1,ENAME); resultSet = ps6.executeQuery(); while (resultSet.next()) {  // 输出courses表中的name字段  System.out.println(resultSet.getString("ENAME"));  System.out.println(resultSet.getString("DNAME")); }***  ***7.***  ***Scanner in = new Scanner(System.in); System.out.println("请输入你要查询的参加项目的项目名1："); String PNO1 = in.nextLine(); System.out.println("请输入你要查询的参加项目的项目名2："); String PNO2 = in.nextLine(); PreparedStatement ps7 = connection.prepareStatement("SELECT ESSN FROM `works\_on` WHERE `PNO` = ?\n" +  "AND `ESSN` IN \n" +  "( SELECT `ESSN` FROM `works\_on` WHERE `PNO` = ?)\n"); ps7.setString(1,PNO1); ps7.setString(2,PNO2); resultSet = ps7.executeQuery(); while (resultSet.next()) {  // 输出courses表中的name字段  System.out.println(resultSet.getString("ESSN")); }***  图7  图8  ***8.***  ***Scanner in = new Scanner(System.in); System.out.println("请输入你要查询平均部门工资上限："); int SALARY = in.nextInt(); PreparedStatement ps8 = connection.prepareStatement("SELECT DNAME FROM `department` WHERE `DNO` IN \n" +  "( SELECT `DNO` FROM `employee` GROUP BY `DNO` HAVING avg( `SALARY`) < ?); "); ps8.setInt(1,SALARY); resultSet = ps8.executeQuery(); while (resultSet.next()) {  // 输出courses表中的name字段  System.out.println(resultSet.getString("DNAME")); }***  图9  ***9.***  ***Scanner in = new Scanner(System.in); System.out.println("请输入你要查询员工至少参加项目数："); int COUNT\_P = in.nextInt(); System.out.println("请输入你要查询员工工作时间上限："); int TIME = in.nextInt(); PreparedStatement ps9 = connection.prepareStatement("SELECT ENAME FROM `employee` WHERE `ESSN` IN \n" +  "( SELECT `ESSN` FROM `works\_on` GROUP BY `ESSN` HAVING COUNT( `PNO`) > ? AND SUM( `HOURS\_PER\_WEEK`) < ?);"); ps9.setInt(1,COUNT\_P); ps9.setInt(2,TIME); resultSet = ps9.executeQuery(); while (resultSet.next()) {  // 输出courses表中的name字段  System.out.println(resultSet.getString("ENAME")); }*** | | | | | | | |
| 实验结论（结果分析、遇到的困难和解决方法等） | | | | | | 备注 |  |
| 一开始不知道怎么向其中传入参数，后来上网查找发现了方法 | | | | | | | |

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| 实验地点 | | 研究院二楼 | | | 实验时间 | 2021年 5 月 15日 | |
| 实验名称 | | 实验三：基于阿里云数据库的数据库应用系统开发 | | | | | |
| 实验环境 | | 阿里云数据库、Java、C++等 | | | | | |
| 实验目标 | | | | | | | |
| 在熟练掌握MySQL基本命令、SQL语言以及用高级程序语言编写MySQL操作程序的基础上，学习简单数据库系统的设计方法，包括数据库概要设计、逻辑设计。 | | | | | | | |
| 实验内容（实验过程和相应的实验结果展示） | | | | | | | |
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