

《数据库系统原理》实验报告（六）

题目：SQL 综合实验

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实验环境：Docker + mariadb

实验步骤及结果截图：

- (1) 建表（见附录一），表内字段的类型可以自行定义（合理即可），注意建表时不要忽略各表的主键约束和表间的外键约束；

表名: Book	
字段	说明
bno	书号
bname	书名
author	作者
price	单价

表名: Student	
字段	说明
sno	学号
sname	姓名
grade	年级

P. S. Borrow 表的 bstate 字段（用灰色标注的）是第 9 小题需要额外添加的字段，此处建表时可暂时忽略；

表名: Borrow	
字段	说明
sno	学号, 外键
bno	书号, 外键
rdate	还书截至日期, 现实日期小于这个日期视为图书借阅未到期, 现实日期大于这个日期视为图书借阅已过期
bstate	借阅状态

```

MariaDB [test]> create table Book (
-> bno varchar(10) primary key,
-> bname varchar(30),
-> author varchar(30),
-> price float
-> );
Query OK, 0 rows affected (0.008 sec)

MariaDB [test]> show table;
ERROR 1064 (42000): You have an error in your SQL sy
line 1
MariaDB [test]> show tables;
+-----+
| Tables_in_test |
+-----+
| Book           |
+-----+
1 row in set (0.000 sec)

```

```

MariaDB [test]> create table Student (
-> sno varchar(10) primary key,
-> sname varchar(30),
-> grade varchar(5)
-> );
Query OK, 0 rows affected (0.006 sec)

MariaDB [test]> create table Borrow (
-> sno varchar(10),
-> bno varchar(10),
-> rdate datetime,
-> primary key(sno, bno),
-> foreign key(sno) references Student(sno) on delete cascade,
-> foreign key(bno) references Book(bno) on delete cascade
-> );
Query OK, 0 rows affected (0.012 sec)

MariaDB [test]> show tables;
+-----+
| Tables_in_test |
+-----+
| Book           |
| Borrow         |
| Student        |
+-----+
3 rows in set (0.000 sec)

```

```
MariaDB [test]> desc Book;
+-----+-----+-----+-----+-----+
| Field | Type          | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+
| bno   | varchar(10)   | NO   | PRI | NULL    |       |
| bname | varchar(30)   | YES  |     | NULL    |       |
| author | varchar(30)   | YES  |     | NULL    |       |
| price | float         | YES  |     | NULL    |       |
+-----+-----+-----+-----+-----+
4 rows in set (0.001 sec)

MariaDB [test]> desc Borrow;
+-----+-----+-----+-----+-----+
| Field | Type          | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+
| sno   | varchar(10)   | NO   | PRI | NULL    |       |
| bno   | varchar(10)   | NO   | PRI | NULL    |       |
| rdate | datetime      | YES  |     | NULL    |       |
+-----+-----+-----+-----+-----+
3 rows in set (0.001 sec)

MariaDB [test]> desc Student;
+-----+-----+-----+-----+-----+
| Field | Type          | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+
| sno   | varchar(10)   | NO   | PRI | NULL    |       |
| sname | varchar(30)   | YES  |     | NULL    |       |
| grade | varchar(5)    | YES  |     | NULL    |       |
+-----+-----+-----+-----+-----+
3 rows in set (0.001 sec)
```

- (2) 插入样例数据（见附录二），当然样例数据也可自行定义，能够与后续题意相符即可；

```
MariaDB [test]> insert into Book values
-> ('T1001','Java 程序设计','李新民',23.5),
-> ('T1002','数据库原理及应用','王珊',27),
-> ('T1003','Java 高级编程','陈海',23.5),
-> ('T1004','大学英语','张宁',18.5),
-> ('T1005','C++程序设计','马品三',33.5),
-> ('T1006','数据结构','刘子单',35);
Query OK, 6 rows affected (0.001 sec)
Records: 6 Duplicates: 0 Warnings: 0

MariaDB [test]> insert into Student values
-> ('K001','张三','大一'),
-> ('K002','李四','大二'),
-> ('K003','王五','大三'),
-> ('K004','赵六','大四'),
-> ('K005','刘七','大四');
Query OK, 5 rows affected (0.001 sec)
Records: 5 Duplicates: 0 Warnings: 0

MariaDB [test]> insert into Borrow values
-> ('K001','T1006','2022-10-9'),
-> ('K001','T1001','2022-3-1'),
-> ('K001','T1004','2022-5-7'),
-> ('K002','T1002','2022-6-9'),
-> ('K002','T1003','2022-12-5'),
-> ('K002','T1001','2022-11-3'),
-> ('K003','T1005','2022-9-4'),
-> ('K004','T1002','2022-2-5');
Query OK, 8 rows affected (0.001 sec)
Records: 8 Duplicates: 0 Warnings: 0
```

```
MariaDB [test]> select * from Book;
+-----+-----+-----+-----+
| bno  | bname                | author | price |
+-----+-----+-----+-----+
| T1001 | Java 程序设计        | 李新民 | 23.5  |
| T1002 | 数据库原理及应用    | 王珊   | 27    |
| T1003 | Java 高级编程        | 陈海   | 23.5  |
| T1004 | 大学英语            | 张宁   | 18.5  |
| T1005 | C++程序设计          | 马品三 | 33.5  |
| T1006 | 数据结构            | 刘子单 | 35    |
+-----+-----+-----+-----+
6 rows in set (0.000 sec)

MariaDB [test]> select * from Borrow;
+-----+-----+-----+-----+
| sno  | bno  | rdate                |
+-----+-----+-----+-----+
| K001 | T1001 | 2022-03-01 00:00:00 |
| K001 | T1004 | 2022-05-07 00:00:00 |
| K001 | T1006 | 2022-10-09 00:00:00 |
| K002 | T1001 | 2022-11-03 00:00:00 |
| K002 | T1002 | 2022-06-09 00:00:00 |
| K002 | T1003 | 2022-12-05 00:00:00 |
| K003 | T1005 | 2022-09-04 00:00:00 |
| K004 | T1002 | 2022-02-05 00:00:00 |
+-----+-----+-----+-----+
8 rows in set (0.000 sec)

MariaDB [test]> select * from Student;
+-----+-----+-----+
| sno  | sname | grade |
+-----+-----+-----+
| K001 | 张三  | 大一  |
| K002 | 李四  | 大二  |
| K003 | 王五  | 大三  |
| K004 | 赵六  | 大四  |
| K005 | 刘七  | 大四  |
+-----+-----+-----+
```

- (3) 查询书名中包含“程序设计”的图书信息，输出所有信息（包括书名、书号、作者、单价），并按照单价降序排列；

```
MariaDB [test]> select * from Book
-> where bname like '%程序设计%'
-> order by price desc;
+-----+-----+-----+-----+
| bno  | bname                | author | price |
+-----+-----+-----+-----+
| T1005 | C++程序设计          | 马品三 | 33.5  |
| T1001 | Java 程序设计        | 李新民 | 23.5  |
+-----+-----+-----+-----+
2 rows in set (0.000 sec)
```

- (4) 查询借阅了书名为“数据库原理及应用”的学生信息，输出该学生的学号、姓名和年级；

```
MariaDB [test]> select s.sno, s.sname, s.grade
-> from Student s
-> join Borrow b on s.sno = b.sno
-> join Book bo on b.bno = bo.bno
-> where bo.bname = '数据库原理及应用';
+-----+-----+-----+
| sno  | sname | grade |
+-----+-----+-----+
| K002 | 李四  | 大二  |
| K004 | 赵六  | 大四  |
+-----+-----+-----+
2 rows in set (0.000 sec)
```

- (5) 统计每个学生借书信息，输出每个学生的学号、借书书名和还书日期；

```
MariaDB [test]> select s.sno, bo.bname, b.rdate
-> from Student s
-> join Borrow b on s.sno = b.sno
-> join Book bo on b.bno = bo.bno
-> ;
```

sno	bname	rdate
K001	Java 程序设计	2022-03-01 00:00:00
K001	大学英语	2022-05-07 00:00:00
K001	数据结构	2022-10-09 00:00:00
K002	Java 程序设计	2022-11-03 00:00:00
K002	数据库原理及应用	2022-06-09 00:00:00
K002	Java 高级编程	2022-12-05 00:00:00
K003	C++程序设计	2022-09-04 00:00:00
K004	数据库原理及应用	2022-02-05 00:00:00

8 rows in set (0.000 sec)

- (6) 查询所有借阅已过期图书的信息，输出学生姓名、书名和还书日期；

P.S. 借阅已过期图书指的是“现实日期”大于还书截止日期字段的图书，
“现实日期”可以自行指定，附录二中的数据样例将 11 月 8 日作为“现实日期”；

指定今天日期为 2022-11-08

```
MariaDB [test]> select s.sname, bo.bname, b.rdate
-> from Student s
-> join Borrow b on s.sno = b.sno
-> join Book bo on b.bno = bo.bno
-> where b.rdate < '2022-11-08';
```

sname	bname	rdate
张三	Java 程序设计	2022-03-01 00:00:00
张三	大学英语	2022-05-07 00:00:00
张三	数据结构	2022-10-09 00:00:00
李四	Java 程序设计	2022-11-03 00:00:00
李四	数据库原理及应用	2022-06-09 00:00:00
王五	C++程序设计	2022-09-04 00:00:00
赵六	数据库原理及应用	2022-02-05 00:00:00

7 rows in set (0.000 sec)

- (7) 查询没有借阅过书的学生信息，输出学生姓名和学号；

```
MariaDB [test]> select s.sno, s.sname
-> from Student s
-> where not exists (
-> select 1
-> from Borrow b
-> where s.sno = b.sno
-> );
```

sno	sname
K005	刘七

1 row in set (0.001 sec)

- (8) 查询借了"Java 程序设计"但没有借"数据库原理及应用"的读者信息，输出这些学生的学号，并按照学号升序排列；

```
MariaDB [test]> select distinct s.sno
-> from Student s
-> join Borrow b1 on s.sno = b1.sno
-> join Book bo1 on b1.bno = bo1.bno and bo1.bname = 'Java程序设计'
-> where s.sno not in (
-> select s2.sno
-> from Student s2
-> join Borrow b2 on s2.sno = b2.sno
-> join Book bo2 on b2.bno = bo2.bno and bo2.bname = '数据库原理及应用'
-> );
Empty set (0.001 sec)
```

- (9) 创建一个过程，使之能够实现如下功能：

- a) 修改借阅表，增加字段“借阅状态”（字段名为“bstate”，数据类型可自行定义），字段含义为表示图书的借阅状态是否已经过期；
- b) 并根据表中已有数据为该字段赋值（所赋的值与表定义时的数据类型保持一致即可，比如可以定义已到期图书的“借阅状态”为 True，未到期图书的“借阅状态”为 False），要求使用 if 语句进行条件判断；

```
MariaDB [test]> delimiter $$
MariaDB [test]> create procedure update_bstate()
-> begin declare today_date DATE;
-> set today_date = '2022-11-08';
-> alter table Borrow add column bstate bool;
-> update Borrow
-> set bstate = if(rdate < today_date, TRUE, FALSE);
-> end$$
Query OK, 0 rows affected (0.002 sec)

MariaDB [test]> delimiter ;
```

执行前：

```
MariaDB [test]> desc Borrow;
+-----+-----+-----+-----+-----+
| Field | Type          | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+
| sno   | varchar(10)   | NO   | PRI | NULL    |       |
| bno   | varchar(10)   | NO   | PRI | NULL    |       |
| rdate | datetime      | YES  |     | NULL    |       |
+-----+-----+-----+-----+-----+
3 rows in set (0.001 sec)
```

```
MariaDB [test]> select * from Borrow;
+-----+-----+-----+
| sno  | bno  | rdate                |
+-----+-----+-----+
| K001 | T1001 | 2022-03-01 00:00:00 |
| K001 | T1004 | 2022-05-07 00:00:00 |
| K001 | T1006 | 2022-10-09 00:00:00 |
| K002 | T1001 | 2022-11-03 00:00:00 |
| K002 | T1002 | 2022-06-09 00:00:00 |
| K002 | T1003 | 2022-12-05 00:00:00 |
| K003 | T1005 | 2022-09-04 00:00:00 |
| K004 | T1002 | 2022-02-05 00:00:00 |
+-----+-----+-----+
8 rows in set (0.000 sec)
```

执行后:

```
MariaDB [test]> call update_bstate();
Query OK, 8 rows affected (0.011 sec)

MariaDB [test]> desc Borrow;
+-----+-----+-----+-----+-----+-----+
| Field | Type          | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| sno   | varchar(10)   | NO   | PRI | NULL    |       |
| bno   | varchar(10)   | NO   | PRI | NULL    |       |
| rdate | datetime      | YES  |     | NULL    |       |
| bstate | tinyint(1)    | YES  |     | NULL    |       |
+-----+-----+-----+-----+-----+-----+
4 rows in set (0.001 sec)

MariaDB [test]> select * from Borrow;
+-----+-----+-----+-----+
| sno  | bno  | rdate                | bstate |
+-----+-----+-----+-----+
| K001 | T1001 | 2022-03-01 00:00:00 | 1 |
| K001 | T1004 | 2022-05-07 00:00:00 | 1 |
| K001 | T1006 | 2022-10-09 00:00:00 | 1 |
| K002 | T1001 | 2022-11-03 00:00:00 | 1 |
| K002 | T1002 | 2022-06-09 00:00:00 | 1 |
| K002 | T1003 | 2022-12-05 00:00:00 | 0 |
| K003 | T1005 | 2022-09-04 00:00:00 | 1 |
| K004 | T1002 | 2022-02-05 00:00:00 | 1 |
+-----+-----+-----+-----+
8 rows in set (0.000 sec)
```

(10) (*)修改图书表, 在 bname 列上增加唯一性索引 bname_index, 并按 bname 降序排列;

```
MariaDB [test]> create unique index bname_index on Book(bname);
Query OK, 0 rows affected (0.013 sec)
Records: 0 Duplicates: 0 Warnings: 0
```

唯一性索引的功能展示，第一次成功加入，第二次由于书名重复而失败，以及降序排列：

```
MariaDB [test]> insert into Book (bno, bname, author, price) values ('123456', 'Java程序设计', 'John Doe', 29.99);
Query OK, 1 row affected (0.001 sec)

MariaDB [test]> select * from Book order by bname desc;
+-----+-----+-----+-----+
| bno | bname | author | price |
+-----+-----+-----+-----+
| T1006 | 数据结构 | 刘子单 | 35 |
| T1002 | 数据库原理及应用 | 王珊 | 27 |
| T1004 | 大学英语 | 张宁 | 18.5 |
| 123456 | Java程序设计 | John Doe | 29.99 |
| T1003 | Java 高级编程 | 陈海 | 23.5 |
| T1001 | Java 程序设计 | 李新民 | 23.5 |
| T1005 | C++程序设计 | 马品三 | 33.5 |
+-----+-----+-----+-----+
7 rows in set (0.000 sec)

MariaDB [test]> insert into Book (bno, bname, author, price) values ('T1013', 'Java程序设计', 'Frina', 10.13);
ERROR 1062 (23000): Duplicate entry 'Java程序设计' for key 'bname index'

MariaDB [test]> select * from Book order by bname desc;
+-----+-----+-----+-----+
| bno | bname | author | price |
+-----+-----+-----+-----+
| T1006 | 数据结构 | 刘子单 | 35 |
| T1002 | 数据库原理及应用 | 王珊 | 27 |
| T1004 | 大学英语 | 张宁 | 18.5 |
| 123456 | Java程序设计 | John Doe | 29.99 |
| T1003 | Java 高级编程 | 陈海 | 23.5 |
| T1001 | Java 程序设计 | 李新民 | 23.5 |
| T1005 | C++程序设计 | 马品三 | 33.5 |
+-----+-----+-----+-----+
7 rows in set (0.000 sec)
```

出现的问题：

对 SQL 语句用法不熟练，经常使用错误。

解决方案：

经常搜索查询，不断尝试练习。