深 圳 大 学

实 验 报 告

课程名	3称:	数据库系统
实验户	序号:	_ 实验1
实验名	名称: .	SQL的DDL语言和单表查询
学	号:	2022280310
姓	名:	

实验完成日期: _2024年 9 月 24 日

一、实验目的:

- 1、了解 DBMS 系统的功能、软件组成;
- 2、掌握利用 SQL 语句定义、和简单操纵数据库的方法。

二、实验要求:

- 1、在课外安装相关软件并浏览软件自带的帮助文件和功能菜单,了解 DBMS 的功能、结构;
 - 2、创建一个有两个关系表的数据库; (建议采用 ORACLE ISQLPLUS)
 - 3、数据库、关系表定义;
 - 4、学习定义关系表的约束(主键、外键、自定义);
 - 5、了解 SQL 的数据定义功能;
 - 6、了解 SQL 的操纵基本功能;
 - 8、了解视图的概念;

三、实验设备:

计算机、数据库管理系统如 DB2, Oracle 等软件。

四、实验内容

1、使用 SQL DDL 语句**建立关系数据库模式,并用 DML 数据**如下;

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7369	SMITH	CLERK	7902	17-Dec-90	13750		20
7499	ALLEN	SALESMAN	7698	20-FEB-89	19000	6400	30
7521	WARD	SALESMAN	7698	22-FEB-93	18500	4250	30
7566	JONES	MANAGER	MANAGER 7839 02-APR-89		26850		20
7654	MARTIN	SALESMAN	7698	28-SEP-97	15675	3500	30
7698	BLAKE	MANAGER	7839	01-MAY-90	24000		30
7782	CLARK	MANAGER	7839	09-JUN-88	27500		10
7788	SCOTT	ANALYST	7566	19-APR-87	19500		20
7839	KING	PRESIDENT		17-NOV-83	82500		10
7844	TURNER	SALESMAN	7698	08-SEP-92	18500	6250	30
7876	ADAMS	CLERK	7788	23-MAY-96	11900		20
7900	JAMES	CLERK	7698	03-DEC-95	12500		30
7902	FORD	ANALYST	7566	03-DEC-91	21500		20
7934	MILLER	CLERK	7782	23-JAN-95	13250		10
3258	GREEN	SALESMAN	4422	24-Jul-95	18500	2750	50
4422	STEVENS	MANAGER	7839	14-Jan-94	24750		50

6548 BARNES CLERK 4422 16-Jan-95 11950 50

DEPT+(学生自己的学号):

DEPTNO	DNAME	LOC		
10	ACCOUNTING	LONDON		
20	RESEARCH	PRESTON		
30	SALES	LIVERPOOL		
40	OPERATIONS	STAFFORD		
50	MARKETING	LUTON		

以下为学生实验填写部分:

- 1. 参考课件约束方式,创建 emp 和 dept 的 DDL 语句 (要有语句和运行结果截屏)
- 1.1 由于 EMP 表中有 DEPT 表中的外键约束,因此先创建 DEPT 表,如下

```
mysql> CREATE TABLE DEPT2022280310(
-> DEPTNO NUMERIC NOT NULL,
-> DNAME VARCHAR(10) NOT NULL,
-> LOC VARCHAR(10) NOT NULL,
-> PRIMARY KEY(DEPTNO));
Query OK, 0 rows affected (0.01 sec)
```

语句如下:

```
CREATE TABLE DEPT2022280310(
DEPTNO NUMERIC NOT NULL,
DNAME VARCHAR(10) NOT NULL,
LOC VARCHAR(10) NOT NULL,
PRIMARY KEY(DEPTNO)
);
```

1.2 再创建 EMP 表;

```
mysq1> CREATE TABLE emp (

-> empno DECIMAL(10,0) NOT NULL,

-> ename VARCHAR(10) NOT NULL CHECK(ename = UPPER(ename)),

-> job VARCHAR(9),

-> mgr DECIMAL(10,0) REFERENCES emp(empno),

-> hiredate DATE CHECK (hiredate <= SYSDATE),

-> sal DECIMAL(10,2) CHECK (sal > 500),

-> comm DECIMAL(9,0) DEFAULT NULL,

-> deptno DECIMAL(2,0) NOT NULL,

-> PRIMARY KEY (empno),

-> FOREIGN KEY (deptno) REFERENCES dept2022280310(deptno)

-> );

Query OK, O rows affected (0.01 sec)
```

语句如下:

```
CREATE TABLE emp (
empno DECIMAL(10,0) NOT NULL,
ename VARCHAR(10) NOT NULL CHECK(ename = UPPER(ename)),
job VARCHAR(9),
```

```
mgr DECIMAL(10,0) REFERENCES emp(empno),
hiredate DATE CHECK (hiredate <= SYSDATE),
sal DECIMAL(10,2) CHECK (sal > 500),
comm DECIMAL(9,0) DEFAULT NULL,
deptno DECIMAL(2,0) NOT NULL,
PRIMARY KEY (empno),
FOREIGN KEY (deptno) REFERENCES dept2022280310(deptno)
);
```

在 phpMyAdmin 中可以看到两个表成功创建了。



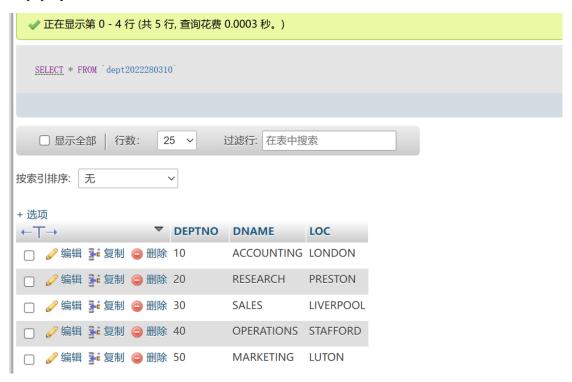
- 2. 插入 emp 和 dept 数据的 DML 语句 (要有语句和运行结果截屏)
- 2.1 向 DEPT 中插入数据,如下

```
mysql> INSERT INTO DEPT2022280310 VALUES
-> (10, 'ACCOUNTING', 'LONDON'),
-> (20, 'RESEARCH', 'PRESTON'),
-> (30, 'SALES', 'LIVERPOOL'),
-> (40, 'OPERATIONS', 'STAFFORD'),
-> (50, 'MARKETING', 'LUTON');
Query OK, 5 rows affected (0.00 sec)
Records: 5 Duplicates: 0 Warnings: 0
```

语句如下:

```
INSERT INTO DEPT2022280310 VALUES
(10, 'ACCOUNTING', 'LONDON'),
(20, 'RESEARCH', 'PRESTON'),
(30, 'SALES', 'LIVERPOOL'),
(40, 'OPERATIONS', 'STAFFORD'),
(50, 'MARKETING', 'LUTON');
```

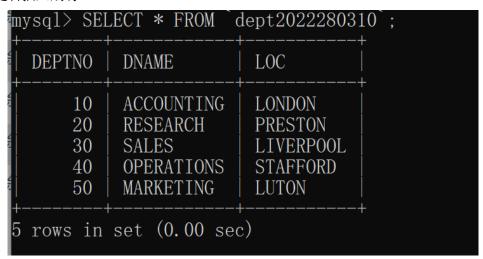
在 phpMyAdmin 中也可以看到数据成功插入;



同时在控制台可以使用语句:

```
SELECT * FROM `dept2022280310`;
```

查看是否插入成功。



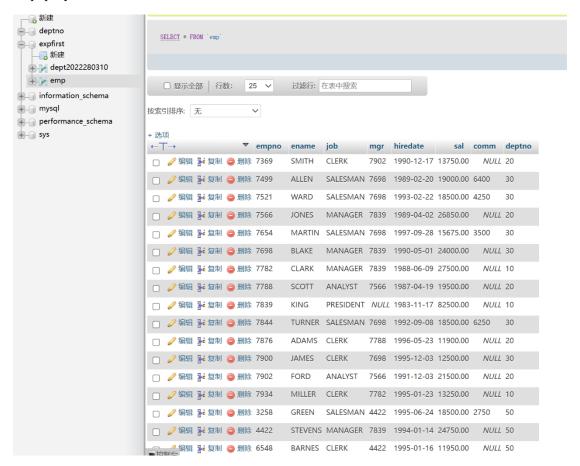
2.2 在 EMP 中插入数据,如下

```
mysql> INSERT INTO EMP VALUES
-> (7369, 'SMITH', 'CLERK', 7902, '1990-12-17', 13750, NULL, 20),
-> (7499, 'ALLEN', 'SALESMAN', 7698, '1989-02-20', 19000, 6400, 30),
-> (7521, 'WARD', 'SALESMAN', 7698, '1993-02-22', 18500, 4250, 30),
-> (7566, 'JONES', 'MANAGER', 7839, '1989-04-02', 26850, NULL, 20),
-> (7654, 'MARTIN', 'SALESMAN', 7698, '1997-09-28', 15675, 3500, 30),
-> (7698, 'BLAKE', 'MANAGER', 7839, '1990-05-01', 24000, NULL, 30),
-> (7782, 'CLARK', 'MANAGER', 7839, '1988-06-09', 27500, NULL, 10),
-> (7788, 'SCOTT', 'ANALYST', 7566, '1987-04-19', 19500, NULL, 20),
-> (7839, 'KING', 'PRESIDENT', NULL, '1983-11-17', 82500, NULL, 10),
-> (7844, 'TURNER', 'SALESMAN', 7698, '1992-09-08', 18500, 6250, 30),
-> (7900, 'JAMES', 'CLERK', 7788, '1996-05-23', 11900, NULL, 20),
-> (7900, 'JAMES', 'CLERK', 7698, '1995-12-03', 12500, NULL, 20),
-> (7934, 'MILLER', 'CLERK', 7782, '1995-01-23', 13250, NULL, 10),
-> (3258, 'GREEN', 'SALESMAN', 4422, '1995-06-24', 18500, 2750, 50),
-> (4422, 'STEVENS', 'MANAGER', 7839, '1994-01-14', 24750, NULL, 50),
-> (64648, 'BARNES', 'CLERK', 4422, '1995-01-16', 11950, NULL, 50);
Query 0K, 17 rows affected (0.00 sec)
Records: 17 Duplicates: 0 Warnings: 0
```

语句如下:

```
INSERT INTO EMP VALUES
(7369, 'SMITH', 'CLERK', 7902, '1990-12-17', 13750, NULL, 20),
(7499, 'ALLEN', 'SALESMAN', 7698, '1989-02-20', 19000, 6400, 30),
(7521, 'WARD', 'SALESMAN', 7698, '1993-02-22', 18500, 4250, 30),
(7566, 'JONES', 'MANAGER', 7839, '1989-04-02', 26850, NULL, 20),
(7654, 'MARTIN', 'SALESMAN', 7698, '1997-09-28', 15675, 3500, 30),
(7698, 'BLAKE', 'MANAGER', 7839, '1990-05-01', 24000, NULL, 30),
(7782, 'CLARK', 'MANAGER', 7839, '1988-06-09', 27500, NULL, 10),
(7788, 'SCOTT', 'ANALYST', 7566, '1987-04-19', 19500, NULL, 20),
(7839, 'KING', 'PRESIDENT', NULL, '1983-11-17', 82500, NULL, 10),
(7844, 'TURNER', 'SALESMAN', 7698, '1992-09-08', 18500, 6250, 30),
(7876, 'ADAMS', 'CLERK', 7788, '1996-05-23', 11900, NULL, 20),
(7900, 'JAMES', 'CLERK', 7698, '1995-12-03', 12500, NULL, 30),
(7902, 'FORD', 'ANALYST', 7566, '1991-12-03', 21500, NULL, 20),
(7934, 'MILLER', 'CLERK', 7782, '1995-01-23', 13250, NULL, 10),
(3258, 'GREEN', 'SALESMAN', 4422, '1995-06-24', 18500, 2750, 50),
(4422, 'STEVENS', 'MANAGER', 7839, '1994-01-14', 24750, NULL, 50),
(6548, 'BARNES', 'CLERK', 4422, '1995-01-16', 11950, NULL, 50);
```

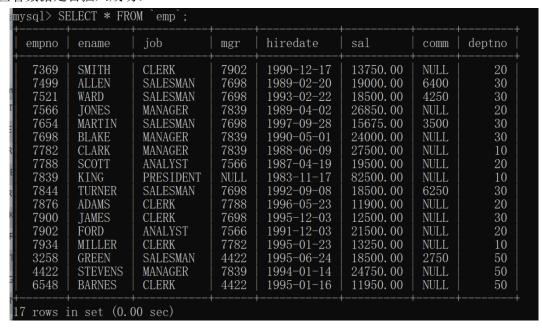
在 phpMyAdmin 中可以看到数据插入成功;



控制台中也可以用语句

SELECT * FROM 'emp';

查看数据是否插入成功。



2.3 最后检查外键约束是否有效

如果外键约束有效,那么向 EMP 表中插入一个 DEPTNO 在 DEPT 表中不存在的数据时会发生错误。

用下面的指令检查

INSERT INTO EMP VALUES

(66,'SZU', 'SCHOOL', 6666, '1983-09-27', 88888.88, NULL, 00);

```
mysql> INSERT INTO EMP VALUES
-> (66,'SZU', 'SCHOOL', 6666, '1983-09-27', 88888.88, NULL, 00);
Query OK, 1 row affected (0.00 sec)
```

发现成功插入,表明外键约束无效。

将 DEPT 表和 EMP 表的引擎改为 InnoDB;

```
ALTER TABLE DEPT2022280310 ENGINE=InnoDB;
```

ALTER TABLE EMP ENGINE=InnoDB;

```
mysql> ALTER TABLE DEPT2022280310 ENGINE=InnoDB;
Query OK, 5 rows affected (0.01 sec)
Records: 5 Duplicates: 0 Warnings: 0
mysql> ALTER TABLE EMP ENGINE=InnoDB;
Query OK, 18 rows affected (0.01 sec)
Records: 18 Duplicates: 0 Warnings: 0
```

再删除刚刚插入的语句,



将 DEPT 设置为 EMP 的外键,

```
mysql> ALTER TABLE EMP ADD FOREIGN KEY(DEPTNO) REFERENCES DEPT2022280310(DEPTNO);
Query OK, 17 rows affected (0.02 sec)
Records: 17 Duplicates: 0 Warnings: 0
```

再次添加检查语句,发现插入失败,说明外键约束有效。

```
mysql> INSERT INTO EMP VALUES

-> (66, SZU', SCHOOL', 6666, 1983-09-27', 88888.88, NULL, 00);
ERROR 1452 (23000): Cannot add or update a child row: a foreign key constraint fails (expfirst emp, CONSTRAINT emp_ibfk_1 FOREIGN KEY (deptno) REFERENCES dept2022280 310 (DEPTNO))
```

3. 老师实验课上选取单表查询的难度较高的题目(要有题目语句和运行结果截屏)

①1.13 Find all the employees whose last names end with S

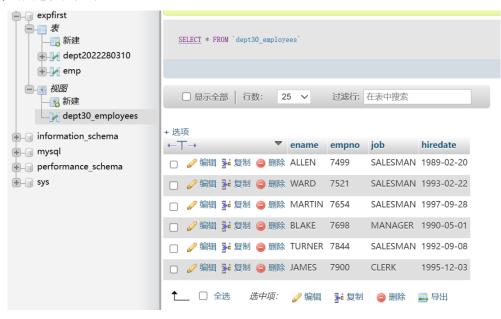
mysql> SF -> ;	ELECT * FRO	OM EMP WHEI	RE ENAMI	E LIKE '%S'			
empno	ename	job	+ mgr	hiredate	sal	comm	deptno
4422 6548 7566 7876 7900	STEVENS BARNES JONES ADAMS JAMES	MANAGER CLERK MANAGER CLERK CLERK	7839 4422 7839 7788 7698	1994-01-14 1995-01-16 1989-04-02 1996-05-23 1995-12-03	24750. 00 11950. 00 26850. 00 11900. 00 12500. 00	NULL NULL NULL NULL NULL	50 50 20 20 30
 5 rows in	5 rows in set (0.00 sec)						

27.9 Create a view for use by personnel in department 30 showing employee name, number, job and hiredate

SELECT 后面跟 mployee name, number, job and hiredate, 设置 view 的列, where 设置查找条件

```
mysql> CREATE VIEW DEPT30_EMPLOYEES AS SELECT ename, empno, job, hiredate FROM
-> EMP WHERE deptno=30;
Query OK, 0 rows affected (0.00 sec)
```

由代码所建视图如下:



③5.4 List the average annual salary for all job groups having more than 2 employees in the group.

由于表中的 SAL 属性表示的是月薪, 需要乘以 12 才是年薪。

45.5 Find all departments with an average commission greater than 25% of average salary.

需要用 having 设置条件 AVG(COMM)>0.25*AVG(SAL)

⑤5.6 Find each department's average annual salary for all its employees except the managers and the president.

用 WHERE 排除两个职业,再根据 department 的编号分组

```
mysq1> SELECT DEPTNO, AVG(SAL) AS AVER_SAL FROM EMP
-> WHERE JOB NOT IN('MANAGER', 'PRESIDENT') GROUP BY DEPTNO
->;

+-----+
| DEPTNO | AVER_SAL |
+-----+
| 10 | 13250.000000 |
20 | 16662.500000 |
30 | 16835.000000 |
50 | 15225.000000 |
+-----+
4 rows in set (0.00 sec)
```

© Compute the daily and hourly salary for employees in department 30, round to the nearest penny. Assume there are 22 working days in a month and 8 working hours in a day.

四舍五入使用 ROUND 函数, 日工资: sa1/22 小时工资: (sa1/22)/8 员工有两个属性:编号和名字

```
nysq1> SELECT EMPNO, ENAME, ROUND(SAL/22, 2) AS DAILY_SAL, ROUND((SAL/22)/8) -> AS HOURLY_SAL FROM EMP WHERE DEPTNO=30;
 EMPNO |
           ENAME
                    DAILY SAL
                                    HOURLY SAL
  7499
           ALLEN
                          863.64
                          840.91
   7521
           WARD
           MARTIN
                          712.50
                                              89
   7654
                         1090.91
   7698
           BLAKE
                                              136
   7844
           TURNER
                          840.91
   7900
                          568.18
           JAMES
                                               71
 rows in set (0.00 sec)
```

五. 实验心得

本次实验较为成功,成功建立了目标数据库。同时遇到了一些问题并加以解决。

1. 在建好表后重新打开控制台,需要选择数据库才能对目标数据库进行插入等操作

```
mysql> use expfirst
Database changed
```

否则直接插入会报错

```
mysql> insert into dept2022280310 values
-> (10, 'ACCOUNTING', 'LONDON'),
-> (20, 'RESEARCH', 'PRESTON'),
-> (30, 'SALES', 'LIVERPOOL'),
-> (40, 'OPERATIONS', 'STAFFORD'),
-> (50, 'MARKETING', 'LUTON');
ERROR 1046 (3D000): No database selected
```

2. 给关系表添加外键时需要保证外键和其引用的列的数据类型必须完全匹配,包括精度。 而我设计表时,EMP 表中的 deptno 列类型是 decimal (2,0),而 dept2022280310 表中的 DEPTNO 列类型是 decimal (10,0),精度不匹配,因此报错。

```
mysql> ALTER TABLE EMP ADD FOREIGN KEY(DEPTNO) REFERENCES DEPT2022280310(DEPTNO); ERROR 1452 (23000): Cannot add or update a child row: a foreign key constraint fails (expfirst. #sql-1468_c, CONSTRAINT #sql-1468_c_ibfk_1 FOREIGN KEY (deptno) REFERENCES dept2022280310 (DEPTNO))
```

后来将 EMP 表中的 deptno 列类型改为 decimal (10,0) 才解决。

```
mysql> ALTER TABLE EMP MODIFY deptno decimal(10,0);
Query OK, 17 rows affected (0.02 sec)
Records: 17 Duplicates: 0 Warnings: 0
```

六. 诚信承诺

本人郑重承诺在 SQL 实验的实施的过程中不发生任何不诚信现象,一切不诚信所导致的后果均由本人承担。

签名(手签,不得打印):

指导教师批阅意见:	
成绩评定:	
	指导教师签字:
	年 月 日
备注:	