实验3 SQL数据完整性

实验目的：

1. 熟悉通过SQL进行数据完整性控制的方法。

实验平台：

1. 数据库管理系统：MySQL

实验内容和要求：

1. 定义若干表，其中包括primary key,foreign key和check的定义。
2. 让表中插入数据，考察primary key如何控制实体完整性。
3. 删除被引用表中的行，考察foreign key中on delete子句如何控制参照完整性。
4. 修改被引用表中的行的primary key，考察foreign key中on update子句如何控制参照完整性。
5. 修改或插入表中数据，考察check子句如何控制校验完整性。
6. 定义一个assertion,并通过修改表中数据考察断言如何控制数据完整性。
7. 定义一个trigger,并通过修改表中数据考察触发器如何起作用。

实验过程：

1. 建立多个新表，包含主键与外键。

```
create table department
    (dept_name      varchar(20),
     building       varchar(15),
     budget             numeric(12,2) check (budget > 0),
     primary key (dept_name)
    );
create table student
    (ID         varchar(5),
     name           varchar(20) not null,
     dept_name      varchar(20),
     primary key (ID),
     foreign key (dept_name) references department
(dept_name)
    );
#注意表的建立顺序，由于student参照了department，必须先建立department。
```

2. 向表中插入数据，

```
insert into department values ('Finance', 'Painter', '120000');
insert into department values ('History', 'Painter', '50000');
insert into department values ('Music', 'Packard', '80000');
insert into department values ('Physics', 'Watson', '70000');
```

	dept_name	building	budget
▶	Finance	Painter	120000.00
	History	Painter	50000.00
	Music	Packard	80000.00
	Physics	Watson	70000.00
*	NULL	NULL	NULL

再插入重复主键的记录。

```
1 insert into department values ('Physics', 'Newyo', '90000');
```

出现错误信息。

14 | 21:11:34 | insert into department values ('Physics', 'Newyo', '90000') | Error Code: 1062. Duplicate entry 'Physics' for key 'department.PRIMARY'

21:11:34 insert into department values ('Physics', 'Newyo', '90000') Error Code: 1062. Duplicate entry 'Physics' for key 'department.PRIMARY' 0.000 sec

3. 删除被引用表中的行，考察foreign key 中on delete 子句如何控制参照完整性。

首先向student表中插入一条记录。

```
1 insert into student values ('22001', 'Brandt', 'History');
```

	ID	name	dept_name
▶	22001	Brandt	History
*	NULL	NULL	NULL

然后删除 'History' 这个系。发现报错（已提前关闭安全模式）。

```
1 Delete from department where dept_name = 'History';
```

17 | 21:20:25 | Delete from department where dept_name = 'History' | Error Code: 1451. Cannot delete or update a parent row: a foreign key constraint fails (`testyh`.`student`, CONS... | 0.015 sec

21:20:25 Delete from department where dept_name = 'History' Error Code: 1451. Cannot delete or update a parent row: a foreign key constraint fails (`testyh`.`student`, CONSTRAINT `student_ibfk_1` FOREIGN KEY (`dept_name`) REFERENCES `department` (`dept_name`)) 0.015 sec

4. 修改被引用表中的行的primary key，考察foreign key 中on update 子句如何控制参照完整性。

```
1 update department
2 set dept_name = 'Math'
3 where building = 'Painter';
```

出现错误信息。

21:25:59 update department set dept_name = 'Math' where building = 'Painter' Error Code: 1451. Cannot delete or update a parent row: a foreign key constraint fails (`testyh`.`student`, CONSTRAINT `student_ibfk_1` FOREIGN KEY (`dept_name`) REFERENCES `department` (`dept_name`)) 0.015 sec

5. 修改或插入表中数据，考察check子句如何控制校验完整性。

```
insert into department values ('Math', 'Nothing', '-8888');
```

报错信息：

21:29:23 insert into department values ('Math', 'Nothing', '-8888') Error Code: 3819. Check constraint 'department_chk_1' is violated. 0.000 sec

6. 定义一个assertion，并通过修改表中数据考察断言如何控制数据完整性。

```
Create assertion money
check
(not exists (select * from department
Where budget>80000));
```

MySQL 不支持断言，无法执行，报错。

```
Create assertion money
check   "assertion" is not valid at this position, expecting ALTER, ANALYZE, BINLOG, CACHE, CALL, CHANGE, ...
(not exists (select * from department
Where budget>80000));
```

7. 定义一个trigger，并通过修改表中数据考察触发器如何起作用。

原先表department：

dept_name	building	budget
Finance	Painter	120000.00
History	Painter	50000.00
Music	Packard	80000.00
Physics	Watson	70000.00
NULL	NULL	NULL

原先表student：

ID	name	dept_name
21401	Garze	Physics
22001	Brandt	History
23121	Chavez	Finance
41827	Chriso	Music
44553	Peltier	Physics
NULL	NULL	NULL

```
#建立触发器
Delimiter $$
Create trigger changemajor
    After update on department
    For each row
Begin
    Update student set dept_name = 'Music'
    where student.name ='Garze';
```

```
end;$$
Delimiter ;

#更新department
update department
set budget = '50000';
where dept_name = 'Physics';
```

更新后department的数据：

dept_name	building	budget
Finance	Painter	120000.00
History	Painter	50000.00
Music	Packard	80000.00
Physics	Watson	50000.00
NULL	NULL	NULL

更新后student的数据：

ID	name	dept_name
21401	Garze	Music
22001	Brandt	History
23121	Chavez	Finance
41827	Chriso	Music
44553	Peltier	Physics
NULL	NULL	NULL