数据库系统及应用作业 2

傅申 PB20000051

题 1.

外模式对应视图, 模式对应基本表, 内模式对应存储文件.

外模式 (视图) `create view` / `drop view`;

模式 (基本表) `create table` / `alter table` / `drop table`;

内模式 (文件) `create index` / `drop index`.

题 2.

(1)
```sql
-- 学生表
create table Student(
    sno varchar(10) primary key,
    sname varchar(50) not null,
    gender varchar(1) check (gender in ('m', 'f')),
    birthdate date
);
-- 课程表
create table Course(
  cno varchar(10) primary key,
  cname varchar(50) not null,
  type int default 0 check (type >= 0 and type <= 3),
  credit decimal
);
-- 选课表
create table SC(
  sno varchar(10),
  cno varchar(10),
  score decimal check (score >= 0 and score <= 100),
  term int check (term >= 1 and term <= 8),
  primary key(sno, cno, term),
  foreign key(sno) references Student(sno),
  foreign key(cno) references Course(cno)
);
```

(2) 1)
```sql
select birthdate
from Student
where sname = '张三';
```

2)
```sql
select sno, sname, gender
from Student
where sname like '李%';
```

3)
```sql
select distinct sno, sname
from SC natural join Course natural join Student
where score is null and type = 0
order by sno;
```

4)
```sql
select sname
from SC natural join Course natural join Student
where type = 0
group by sno
having sum(credit) > 16 and avg(score) >= 75;
```

5)
```sql
-- 若存在学生重修了通识课，使用最高分作为其成绩：
select sno, sname
from (select sno, sname, score
      from (select cno, sno, sname
            from Course, Student
            where type = 2) as full_sc
           natural left outer join
           (select sno, cno, max(score) as score
            from SC
            group by sno, cno) as max_sc
      group by sno, cno) as filtered_sc
group by sno
having min(score) >= 60 and count(*) = count(score);
```

6)
```sql
select cno, cname, type, avg_score, fails / selected as fail_rate
from (select cno, cname, type, avg(score) as avg_score,
             count(score) as selected
      from Course natural join SC
      group by cno) as course_stats
     natural left outer join
     (select cno, count(*) as fails
      from Course natural join SC
      where score < 60
      group by cno) as fail_courses
order by (case type
              when 2 then 0
              when 0 then 1
              when 1 then 2
              when 3 then 3
          end);
```

7)
```sql
select distinct sno, sname, cno, cname
from (select sno, cno, min(term) as first_term
      from SC
      group by sno, cno
      having count(*) > 1) as multiple_enroll
    natural join SC natural join Student natural join Course
where score < 60 and term > first_term
```

题 3.

```sql
select D
from (select *
      from (select * from R where p) as R_p
           natural join
           (select * from S where m) as S_m
      where q) as R_pS_m
     natural join
     T
```