数据库

3.1

```sql
-- Active: 1665215239056@@127.0.0.1@3306



/* 3.1 */

create database hwk1 default character set utf8mb4 collate utf8mb4_unicode_ci;

create table classroom
    (building        varchar(15),
     room_number         varchar(7),
     capacity        numeric(4,0),
     primary key (building, room_number)
    );

create table department
    (dept_name       varchar(20),
     building        varchar(15),
     budget              numeric(12,2) check (budget > 0),
     primary key (dept_name)
    );

create table course
    (course_id       varchar(8),
     title           varchar(50),
     dept_name       varchar(20),
     credits         numeric(2,0) check (credits > 0),
     primary key (course_id),
     foreign key (dept_name) references department (dept_name)
        on delete set null
    );

create table instructor
    (ID          varchar(5),
     name            varchar(20) not null,
     dept_name       varchar(20),
     salary          numeric(8,2) check (salary > 29000),
     primary key (ID),
     foreign key (dept_name) references department (dept_name)
        on delete set null
    );

create table section
    (course_id       varchar(8),
         sec_id          varchar(8),
     semester        varchar(6)
        check (semester in ('Fall', 'Winter', 'Spring', 'Summer')),
     year            numeric(4,0) check (year > 1701 and year < 2100),
     building        varchar(15),
     room_number         varchar(7),
```

```sql
        time_slot_id    varchar(4),
        primary key (course_id, sec_id, semester, year),
        foreign key (course_id) references course (course_id)
            on delete cascade,
        foreign key (building, room_number) references classroom (building,
room_number)
            on delete set null
    );

create table teaches
    (ID          varchar(5),
     course_id       varchar(8),
     sec_id          varchar(8),
     semester        varchar(6),
     year            numeric(4,0),
     primary key (ID, course_id, sec_id, semester, year),
     foreign key (course_id, sec_id, semester, year) references section
(course_id, sec_id, semester, year)
         on delete cascade,
     foreign key (ID) references instructor (ID)
         on delete cascade
    );

create table student
    (ID          varchar(5),
     name            varchar(20) not null,
     dept_name       varchar(20),
     tot_cred        numeric(3,0) check (tot_cred >= 0),
     primary key (ID),
     foreign key (dept_name) references department (dept_name)
         on delete set null
    );

create table takes
    (ID          varchar(5),
     course_id       varchar(8),
     sec_id          varchar(8),
     semester        varchar(6),
     year            numeric(4,0),
     grade               varchar(2),
     primary key (ID, course_id, sec_id, semester, year),
     foreign key (course_id, sec_id, semester, year) references section
(course_id, sec_id, semester, year)
         on delete cascade,
     foreign key (ID) references student (ID)
         on delete cascade
    );

create table advisor
    (s_ID           varchar(5),
     i_ID           varchar(5),
     primary key (s_ID),
     foreign key (i_ID) references instructor (ID)
         on delete set null,
     foreign key (s_ID) references student (ID)
         on delete cascade
    );
```

```sql
create table time_slot
    (time_slot_id       varchar(4),
     day                varchar(1),
     start_hr           numeric(2) check (start_hr >= 0 and start_hr < 24),
     start_min          numeric(2) check (start_min >= 0 and start_min < 60),
     end_hr             numeric(2) check (end_hr >= 0 and end_hr < 24),
     end_min            numeric(2) check (end_min >= 0 and end_min < 60),
     primary key (time_slot_id, day, start_hr, start_min)
    );

create table prereq
    (course_id          varchar(8),
     prereq_id          varchar(8),
     primary key (course_id, prereq_id),
     foreign key (course_id) references course (course_id)
        on delete cascade,
     foreign key (prereq_id) references course (course_id)
    );



delete from prereq;
delete from time_slot;
delete from advisor;
delete from takes;
delete from student;
delete from teaches;
delete from section;
delete from instructor;
delete from course;
delete from department;
delete from classroom;
insert into classroom values ('Packard', '101', '500');
insert into classroom values ('Painter', '514', '10');
insert into classroom values ('Taylor', '3128', '70');
insert into classroom values ('Watson', '100', '30');
insert into classroom values ('Watson', '120', '50');
insert into department values ('Biology', 'Watson', '90000');
insert into department values ('Comp. Sci.', 'Taylor', '100000');
insert into department values ('Elec. Eng.', 'Taylor', '85000');
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');
insert into course values ('BIO-101', 'Intro. to Biology', 'Biology', '4');
insert into course values ('BIO-301', 'Genetics', 'Biology', '4');
insert into course values ('BIO-399', 'Computational Biology', 'Biology', '3');
insert into course values ('CS-101', 'Intro. to Computer Science', 'Comp. Sci.',
'4');
insert into course values ('CS-190', 'Game Design', 'Comp. Sci.', '4');
insert into course values ('CS-315', 'Robotics', 'Comp. Sci.', '3');
insert into course values ('CS-319', 'Image Processing', 'Comp. Sci.', '3');
insert into course values ('CS-347', 'Database System Concepts', 'Comp. Sci.',
'3');
insert into course values ('EE-181', 'Intro. to Digital Systems', 'Elec. Eng.',
'3');
insert into course values ('FIN-201', 'Investment Banking', 'Finance', '3');
insert into course values ('HIS-351', 'World History', 'History', '3');
```

```sql
insert into course values ('MU-199', 'Music Video Production', 'Music', '3');
insert into course values ('PHY-101', 'Physical Principles', 'Physics', '4');
insert into instructor values ('10101', 'Srinivasan', 'Comp. Sci.', '65000');
insert into instructor values ('12121', 'Wu', 'Finance', '90000');
insert into instructor values ('15151', 'Mozart', 'Music', '40000');
insert into instructor values ('22222', 'Einstein', 'Physics', '95000');
insert into instructor values ('32343', 'El Said', 'History', '60000');
insert into instructor values ('33456', 'Gold', 'Physics', '87000');
insert into instructor values ('45565', 'Katz', 'Comp. Sci.', '75000');
insert into instructor values ('58583', 'Califieri', 'History', '62000');
insert into instructor values ('76543', 'Singh', 'Finance', '80000');
insert into instructor values ('76766', 'Crick', 'Biology', '72000');
insert into instructor values ('83821', 'Brandt', 'Comp. Sci.', '92000');
insert into instructor values ('98345', 'Kim', 'Elec. Eng.', '80000');
insert into section values ('BIO-101', '1', 'Summer', '2017', 'Painter', '514', 'B');
insert into section values ('BIO-301', '1', 'Summer', '2018', 'Painter', '514', 'A');
insert into section values ('CS-101', '1', 'Fall', '2017', 'Packard', '101', 'H');
insert into section values ('CS-101', '1', 'Spring', '2018', 'Packard', '101', 'F');
insert into section values ('CS-190', '1', 'Spring', '2017', 'Taylor', '3128', 'E');
insert into section values ('CS-190', '2', 'Spring', '2017', 'Taylor', '3128', 'A');
insert into section values ('CS-315', '1', 'Spring', '2018', 'Watson', '120', 'D');
insert into section values ('CS-319', '1', 'Spring', '2018', 'Watson', '100', 'B');
insert into section values ('CS-319', '2', 'Spring', '2018', 'Taylor', '3128', 'C');
insert into section values ('CS-347', '1', 'Fall', '2017', 'Taylor', '3128', 'A');
insert into section values ('EE-181', '1', 'Spring', '2017', 'Taylor', '3128', 'C');
insert into section values ('FIN-201', '1', 'Spring', '2018', 'Packard', '101', 'B');
insert into section values ('HIS-351', '1', 'Spring', '2018', 'Painter', '514', 'C');
insert into section values ('MU-199', '1', 'Spring', '2018', 'Packard', '101', 'D');
insert into section values ('PHY-101', '1', 'Fall', '2017', 'Watson', '100', 'A');
insert into teaches values ('10101', 'CS-101', '1', 'Fall', '2017');
insert into teaches values ('10101', 'CS-315', '1', 'Spring', '2018');
insert into teaches values ('10101', 'CS-347', '1', 'Fall', '2017');
insert into teaches values ('12121', 'FIN-201', '1', 'Spring', '2018');
insert into teaches values ('15151', 'MU-199', '1', 'Spring', '2018');
insert into teaches values ('22222', 'PHY-101', '1', 'Fall', '2017');
insert into teaches values ('32343', 'HIS-351', '1', 'Spring', '2018');
insert into teaches values ('45565', 'CS-101', '1', 'Spring', '2018');
insert into teaches values ('45565', 'CS-319', '1', 'Spring', '2018');
insert into teaches values ('76766', 'BIO-101', '1', 'Summer', '2017');
insert into teaches values ('76766', 'BIO-301', '1', 'Summer', '2018');
insert into teaches values ('83821', 'CS-190', '1', 'Spring', '2017');
insert into teaches values ('83821', 'CS-190', '2', 'Spring', '2017');
insert into teaches values ('83821', 'CS-319', '2', 'Spring', '2018');
```

```sql
insert into teaches values ('98345', 'EE-181', '1', 'Spring', '2017');
insert into student values ('00128', 'Zhang', 'Comp. Sci.', '102');
insert into student values ('12345', 'Shankar', 'Comp. Sci.', '32');
insert into student values ('19991', 'Brandt', 'History', '80');
insert into student values ('23121', 'Chavez', 'Finance', '110');
insert into student values ('44553', 'Peltier', 'Physics', '56');
insert into student values ('45678', 'Levy', 'Physics', '46');
insert into student values ('54321', 'Williams', 'Comp. Sci.', '54');
insert into student values ('55739', 'Sanchez', 'Music', '38');
insert into student values ('70557', 'Snow', 'Physics', '0');
insert into student values ('76543', 'Brown', 'Comp. Sci.', '58');
insert into student values ('76653', 'Aoi', 'Elec. Eng.', '60');
insert into student values ('98765', 'Bourikas', 'Elec. Eng.', '98');
insert into student values ('98988', 'Tanaka', 'Biology', '120');
insert into takes values ('00128', 'CS-101', '1', 'Fall', '2017', 'A');
insert into takes values ('00128', 'CS-347', '1', 'Fall', '2017', 'A-');
insert into takes values ('12345', 'CS-101', '1', 'Fall', '2017', 'C');
insert into takes values ('12345', 'CS-190', '2', 'Spring', '2017', 'A');
insert into takes values ('12345', 'CS-315', '1', 'Spring', '2018', 'A');
insert into takes values ('12345', 'CS-347', '1', 'Fall', '2017', 'A');
insert into takes values ('19991', 'HIS-351', '1', 'Spring', '2018', 'B');
insert into takes values ('23121', 'FIN-201', '1', 'Spring', '2018', 'C+');
insert into takes values ('44553', 'PHY-101', '1', 'Fall', '2017', 'B-');
insert into takes values ('45678', 'CS-101', '1', 'Fall', '2017', 'F');
insert into takes values ('45678', 'CS-101', '1', 'Spring', '2018', 'B+');
insert into takes values ('45678', 'CS-319', '1', 'Spring', '2018', 'B');
insert into takes values ('54321', 'CS-101', '1', 'Fall', '2017', 'A-');
insert into takes values ('54321', 'CS-190', '2', 'Spring', '2017', 'B+');
insert into takes values ('55739', 'MU-199', '1', 'Spring', '2018', 'A-');
insert into takes values ('76543', 'CS-101', '1', 'Fall', '2017', 'A');
insert into takes values ('76543', 'CS-319', '2', 'Spring', '2018', 'A');
insert into takes values ('76653', 'EE-181', '1', 'Spring', '2017', 'C');
insert into takes values ('98765', 'CS-101', '1', 'Fall', '2017', 'C-');
insert into takes values ('98765', 'CS-315', '1', 'Spring', '2018', 'B');
insert into takes values ('98988', 'BIO-101', '1', 'Summer', '2017', 'A');
insert into takes values ('98988', 'BIO-301', '1', 'Summer', '2018', null);
insert into advisor values ('00128', '45565');
insert into advisor values ('12345', '10101');
insert into advisor values ('23121', '76543');
insert into advisor values ('44553', '22222');
insert into advisor values ('45678', '22222');
insert into advisor values ('76543', '45565');
insert into advisor values ('76653', '98345');
insert into advisor values ('98765', '98345');
insert into advisor values ('98988', '76766');
insert into time_slot values ('A', 'M', '8', '0', '8', '50');
insert into time_slot values ('A', 'W', '8', '0', '8', '50');
insert into time_slot values ('A', 'F', '8', '0', '8', '50');
insert into time_slot values ('B', 'M', '9', '0', '9', '50');
insert into time_slot values ('B', 'W', '9', '0', '9', '50');
insert into time_slot values ('B', 'F', '9', '0', '9', '50');
insert into time_slot values ('C', 'M', '11', '0', '11', '50');
insert into time_slot values ('C', 'W', '11', '0', '11', '50');
insert into time_slot values ('C', 'F', '11', '0', '11', '50');
insert into time_slot values ('D', 'M', '13', '0', '13', '50');
insert into time_slot values ('D', 'W', '13', '0', '13', '50');
insert into time_slot values ('D', 'F', '13', '0', '13', '50');
insert into time_slot values ('E', 'T', '10', '30', '11', '45 ');
```

```sql
insert into time_slot values ('E', 'R', '10', '30', '11', '45 ');
insert into time_slot values ('F', 'T', '14', '30', '15', '45 ');
insert into time_slot values ('F', 'R', '14', '30', '15', '45 ');
insert into time_slot values ('G', 'M', '16', '0', '16', '50');
insert into time_slot values ('G', 'W', '16', '0', '16', '50');
insert into time_slot values ('G', 'F', '16', '0', '16', '50');
insert into time_slot values ('H', 'W', '10', '0', '12', '30');
insert into prereq values ('BIO-301', 'BIO-101');
insert into prereq values ('BIO-399', 'BIO-101');
insert into prereq values ('CS-190', 'CS-101');
insert into prereq values ('CS-315', 'CS-101');
insert into prereq values ('CS-319', 'CS-101');
insert into prereq values ('CS-347', 'CS-101');
insert into prereq values ('EE-181', 'PHY-101');




/* a. */
select title from course where dept_name='Comp.Sci' and credits = 3

/* b. */
select distinct takes.ID
from takes,instructor,teaches
where takes.course_id = teaches.course_id AND
    takes.sec_id = teaches.sec_id AND
    takes.semester = teaches.semester AND
    takes.year = teaches.year AND
    teaches.id = instructor.id AND
    instructor.name = 'Einstein'

/* c. */
select max(salary) from instructor

/* d. */
select ID,name
from instructor
where salary = (select max(salary) from instructor)

/* e. */
select course_id, sec_id,
    (select count(ID)
    from takes
    where takes.year = section.year
        and takes.semester = section.semester
        and takes.course_id = section.course_id
        and takes.sec_id = section.sec_id)
    as enrollment
from section
where semester = 'Fall'
and year = 2009

/* e.第二种写法 */
select takes.course_id, takes.sec_id, count(ID)
from section, takes
where takes.course_id = section.course_id
    and takes.sec_id = section.sec_id
```

```sql
    and takes.semester = section.semester
    and takes.year = section.year
    and takes.semester = 'Fall'
    and takes.year = 2009
group by takes.course_id,takes.sec_id

/* f. */
select max(enrollment)
from (select count(ID) as enrollment
    from section, takes
    where takes.course_id = section.course_id
        and takes.sec_id = section.sec_id
        and takes.semester = section.semester
        and takes.year = section.year
        and takes.semester = 'Fall'
        and takes.year = 2009
        group by takes.course_id, takes.sec_id)
        as enrollment
        /* 不加这个as enrollment会报错：需要有表名 */

/* g. */
with sec_enrollment as (
    select takes.course_id, takes.sec_id, count(ID) as enrollment
    from section, takes
    where  takes.year = section.year
        and takes.semester = section.semester
        and takes.course_id = section.course_id
        and takes.sec_id = section.sec_id
        and takes.semester = 'Fall'
        and takes.year = 2009
    group by takes.course_id, takes.sec_id
)
select course_id, sec_id
from sec_enrollment
where enrollment = (select max(enrollment) from sec_enrollment)
```

3.9

```sql
-- Active: 1665215239056@@127.0.0.1@3306

/* 3.9 */

create database hwk2 default character set utf8mb4 collate utf8mb4_unicode_ci;

create table employee
    (
        employee_name  varchar(15),
        street varchar(15),
        city varchar(15)
    );

create table works
    (
```

```
                employee_name  varchar(15),
                company_name varchar(15),
                salary numeric(5,2)
        );

create table company
        (
                company_name varchar(15),
                city varchar(15)
        );

create table managers
        (
                employee_name  varchar(15),
                manager_name varchar(15)
        );


/* a. */
select employee_name, city
from employee natural join works
where company_name = 'First Bank Corporation'

/* b. */
select employee_name, street, city
from employee natural join works
where company_name = 'First Bank Corporation' and salary > 10000

/* c. 未知原因报错 */
(select employee_name
from employee)
EXCEPT
(select employee_name
from employee natural join works
where company_name = 'First Bank Corporation')

/* c. 另一种写法 */
select employee_name from employee
WHERE employee_name not IN (
SELECT employee_name from works where company_name= 'First Bank Corporation')


/* d. */
select employee_name
from works
where salary > (
    select max(salary)
    from works
    where company_name = 'Small Bank Corporation'
)

/* e. */
select company_name
from company
where city in (
    select city
    from company
    where company_name = 'Small Bank Corporation'
```

```
)

/* f. */
with a as (
    select company_name, count(employee_name) as num
    from works
    group by company_name
)
select company_name
from a
where num = (select max(num) from a)

/* g. */
with a as (
    select company_name, avg(salary) as avg_salary
    from works
    group by company_name
)
select company_name
from a
where avg_salary > (
    select avg_salary
    from a
    where company_name = 'First Bank Corporation'
)
```