db 查询实验

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数据库查询及嵌入式实验题目

1. **在employees样本数据库上完成下列查询：**

   - 查询每个部门(departments)的编号(dept_no),名称(dept_name),在该部门工作过的雇员(employees)人数,最低工资(salary),平均工资,最高工资及工资总额；（需要建立一个中间表）

```
drop view eds;
create view eds as
    select de.dept_no, de.emp_no, sum(s.salary) as salary
    from dept_emp de
    left join salaries s on de.emp_no = s.emp_no and de.from_date <= s.from_date and de.to_date >= s.to_date
    group by de.dept_no, de.emp_no;

drop view d_info;
create view d_info as
    select d.dept_no, d.dept_name, count(eds.emp_no) as employee_number, min(eds.salary) as min_salary,
           avg(eds.salary) as avg_salary, max(eds.salary) as max_salary, sum(eds.salary) as sum_salary
    from departments d
    left join eds on d.dept_no = eds.dept_no
    group by d.dept_no, d.dept_name;

select * from d_info;
```

```
d001,Marketing,20211,40000,603119.1983,2214648,11745143267
d002,Finance,17346,39674,632206.1631,2249512,10704514753
d003,Human Resources,17786,39690,491822.5678,1838649,8539023423
d004,Production,73485,39553,520369.3390,2028990,37226181771
d005,Development,85707,39407,530565.9244,2162739,44484238803
d006,Quality Management,20117,39670,481369.6325,1811834,9348679633
d007,Sales,52245,40000,723718.1098,2553036,36996469774
d008,Research,21126,39517,497652.1916,1969028,10134686881
d009,Customer Service,23580,39280,460418.4225,1834295,10385197938
```

   - 查询每个部门(departments)的编号(dept_no),名称(dept_name),及各个时间段(from_date,to_date)担任该部门经理(dept_manager)的雇员的编号(emp_no)和姓名(first_name+last_name)，并按时间段先后显式；

```
select dm.dept_no, d.dept_name, dm.from_date, dm.to_date, e.emp_no, concat(e.first_name, concat(' ', e.last_name)) as name
from dept_manager dm
left join departments d on dm.dept_no = d.dept_no
left join employees e on dm.emp_no = e.emp_no
order by dm.from_date;
```

```
d001,Marketing,1985-01-01,1991-10-01,110022,Margareta Markovitch
d002,Finance,1985-01-01,1989-12-17,110085,Ebru Alpin
d003,Human Resources,1985-01-01,1992-03-21,110183,Shirish Ossenbruggen
d004,Production,1985-01-01,1988-09-09,110303,Krassimir Wegerle
d005,Development,1985-01-01,1992-04-25,110511,DeForest Hagimont
d006,Quality Management,1985-01-01,1989-05-06,110725,Peternela Onuegbe
d007,Sales,1985-01-01,1991-03-07,111035,Przemyslawa Kaelbling
d008,Research,1985-01-01,1991-04-08,111400,Arie Staelin
d009,Customer Service,1985-01-01,1988-10-17,111692,Tonny Butterworth
d004,Production,1988-09-09,1992-08-02,110344,Rosine Cools
d009,Customer Service,1988-10-17,1992-09-08,111784,Marjo Giarratana
d006,Quality Management,1989-05-06,1991-09-12,110765,Rutger Hofmeyr
d002,Finance,1989-12-17,9999-01-01,110114,Isamu Legleitner
d007,Sales,1991-03-07,9999-01-01,111133,Hauke Zhang
d008,Research,1991-04-08,9999-01-01,111534,Hilary Kambil
d006,Quality Management,1991-09-12,1994-06-28,110800,Sanjoy Quadeer
d001,Marketing,1991-10-01,9999-01-01,110039,Vishwani Minakawa
d003,Human Resources,1992-03-21,9999-01-01,110228,Karsten Sigstam
d005,Development,1992-04-25,9999-01-01,110567,Leon DasSarma
d004,Production,1992-08-02,1996-08-30,110386,Shem Kieras
```

```
d009,Customer Service,1992-09-08,1996-01-03,111877,Xiaobin Spinelli
d006,Quality Management,1994-06-28,9999-01-01,110854,Dung Pesch
d009,Customer Service,1996-01-03,9999-01-01,111939,Yuchang Weedman
d004,Production,1996-08-30,9999-01-01,110420,Oscar Ghazalie
```

- 查询每位雇员的编号(emp_no),姓名(first_name+last_name),及各个时间段(from_date,end_data)的工资额(salary),并按时间段先后显式；

```
select e.emp_no, concat(e.first_name, concat(' ', e.last_name)) as name, s.from_date, s.to_date, s.salary
from salaries s
left join employees e on e.emp_no = s.emp_no
limit 20

10001,Georgi Facello,1986-06-26,1987-06-26,60117
10001,Georgi Facello,1987-06-26,1988-06-25,62102
10001,Georgi Facello,1988-06-25,1989-06-25,66074
10001,Georgi Facello,1989-06-25,1990-06-25,66596
10001,Georgi Facello,1990-06-25,1991-06-25,66961
10001,Georgi Facello,1991-06-25,1992-06-24,71046
10001,Georgi Facello,1992-06-24,1993-06-24,74333
10001,Georgi Facello,1993-06-24,1994-06-24,75286
10001,Georgi Facello,1994-06-24,1995-06-24,75994
10001,Georgi Facello,1995-06-24,1996-06-23,76884
10001,Georgi Facello,1996-06-23,1997-06-23,80013
10001,Georgi Facello,1997-06-23,1998-06-23,81025
10001,Georgi Facello,1998-06-23,1999-06-23,81097
10001,Georgi Facello,1999-06-23,2000-06-22,84917
10001,Georgi Facello,2000-06-22,2001-06-22,85112
10001,Georgi Facello,2001-06-22,2002-06-22,85097
10001,Georgi Facello,2002-06-22,9999-01-01,88958
10002,Bezalel Simmel,1996-08-03,1997-08-03,65828
10002,Bezalel Simmel,1997-08-03,1998-08-03,65909
10002,Bezalel Simmel,1998-08-03,1999-08-03,67534
```

- 查询每位雇员的编号(emp_no),姓名(first_name+last_name),及各个时间段(from_date,end_data)的工作部门名称(dept_name),并按时间段先后显式；

```
select e.emp_no, concat(e.first_name, concat(' ', e.last_name)) as name, de.from_date, de.to_date, d.dept_name
from dept_emp de
left join employees e on de.emp_no = e.emp_no
left join departments d on de.dept_no = d.dept_no
limit 20;

10001,Georgi Facello,1986-06-26,9999-01-01,Development
10002,Bezalel Simmel,1996-08-03,9999-01-01,Sales
10003,Parto Bamford,1995-12-03,9999-01-01,Production
10004,Chirstian Koblick,1986-12-01,9999-01-01,Production
10005,Kyoichi Maliniak,1989-09-12,9999-01-01,Human Resources
10006,Anneke Preusig,1990-08-05,9999-01-01,Development
10007,Tzvetan Zielinski,1989-02-10,9999-01-01,Research
10008,Saniya Kalloufi,1998-03-11,2000-07-31,Development
10009,Sumant Peac,1985-02-18,9999-01-01,Quality Management
10010,Duangkaew Piveteau,1996-11-24,2000-06-26,Production
10010,Duangkaew Piveteau,2000-06-26,9999-01-01,Quality Management
10011,Mary Sluis,1990-01-22,1996-11-09,Customer Service
10012,Patricio Bridgland,1992-12-18,9999-01-01,Development
10013,Eberhardt Terkki,1985-10-20,9999-01-01,Human Resources
10014,Berni Genin,1993-12-29,9999-01-01,Development
10015,Guoxiang Nooteboom,1992-09-19,1993-08-22,Research
10016,Kazuhito Cappelletti,1998-02-11,9999-01-01,Sales
10017,Cristinel Bouloucos,1993-08-03,9999-01-01,Marketing
10018,Kazuhide Peha,1992-07-29,9999-01-01,Production
10018,Kazuhide Peha,1987-04-03,1992-07-29,Development
```

- 查询每位雇员的编号(emp_no),姓名(first_name+last_name),及任职过的部门数；

```
select e.emp_no, concat(e.first_name, concat(' ', e.last_name)) as name, count(distinct de.dept_no) as number
from employees e
left join dept_emp de on e.emp_no = de.emp_no
group by e.emp_no
```

```
limit 20;

10001,Georgi Facello,1
10002,Bezalel Simmel,1
10003,Parto Bamford,1
10004,Chirstian Koblick,1
10005,Kyoichi Maliniak,1
10006,Anneke Preusig,1
10007,Tzvetan Zielinski,1
10008,Saniya Kalloufi,1
10009,Sumant Peac,1
10010,Duangkaew Piveteau,2
10011,Mary Sluis,1
10012,Patricio Bridgland,1
10013,Eberhardt Terkki,1
10014,Berni Genin,1
10015,Guoxiang Nooteboom,1
10016,Kazuhito Cappelletti,1
10017,Cristinel Bouloucos,1
10018,Kazuhide Peha,2
10019,Lillian Haddadi,1
10020,Mayuko Warwick,1
```

- 查询每位雇员的编号(emp_no),姓名(first_name+last_name),及各个时间段(from_date,end_data)担任的职务(title),并按时间段先后显式；

```
select e.emp_no, concat(e.first_name, concat(' ', e.last_name)) as name, from_date, to_date, title
from titles t
left join employees e on e.emp_no = t.emp_no
order by t.from_date, emp_no
limit 10;

110022,Margareta Markovitch,1985-01-01,1991-10-01,Manager
110085,Ebru Alpin,1985-01-01,1989-12-17,Manager
110183,Shirish Ossenbruggen,1985-01-01,1992-03-21,Manager
110303,Krassimir Wegerle,1985-01-01,1988-09-09,Manager
110511,DeForest Hagimont,1985-01-01,1992-04-25,Manager
110725,Peternela Onuegbe,1985-01-01,1989-05-06,Manager
111035,Przemyslawa Kaelbling,1985-01-01,1991-03-07,Manager
111400,Arie Staelin,1985-01-01,1991-04-08,Manager
111692,Tonny Butterworth,1985-01-01,1988-10-17,Manager
110114,Isamu Legleitner,1985-01-14,1989-12-17,Senior Staff
```

- 查询担任每种职务(title)的雇员人数；

```
select title, count(distinct emp_no) as number
from titles t
where t.to_date = '9999-01-01'
group by title;

Assistant Engineer,3588
Engineer,30983
Manager,9
Senior Engineer,85939
Senior Staff,82024
Staff,25526
Technique Leader,12055
```

- 查询每个部门中担任每种职务(title)的雇员人数；

```
select d.dept_no, title, count(distinct t.emp_no)
from departments d
left join dept_emp de on d.dept_no = de.dept_no
left join titles t on de.emp_no = t.emp_no
where de.to_date = '9999-01-01' and t.to_date = '9999-01-01'
group by d.dept_no, title

d001,Manager,1
d001,Senior Staff,11290
d001,Staff,3551
d002,Manager,1
```

```
d002,Senior Staff,9545
d002,Staff,2891
d003,Manager,1
d003,Senior Staff,9824
d003,Staff,3073
d004,Assistant Engineer,1402
d004,Engineer,12081
d004,Manager,1
d004,Senior Engineer,33625
d004,Senior Staff,1123
d004,Staff,349
d004,Technique Leader,4723
d005,Assistant Engineer,1652
d005,Engineer,14040
d005,Manager,1
d005,Senior Engineer,38816
d005,Senior Staff,1085
d005,Staff,315
d005,Technique Leader,5477
d006,Assistant Engineer,389
d006,Engineer,3405
d006,Manager,1
d006,Senior Engineer,9458
d006,Technique Leader,1293
d007,Manager,1
d007,Senior Staff,28797
d007,Staff,8903
d008,Assistant Engineer,77
d008,Engineer,830
d008,Manager,1
d008,Senior Engineer,2250
d008,Senior Staff,9092
d008,Staff,2870
d008,Technique Leader,321
d009,Assistant Engineer,68
d009,Engineer,627
d009,Manager,1
d009,Senior Engineer,1790
d009,Senior Staff,11268
d009,Staff,3574
d009,Technique Leader,241
```

- 查询每位雇员的编号(emp_no),姓名(first_name+last_name),及工资额最高的时间段(from_date,end_data)及其工资额；（存在一个雇员有两次最工资额的情况）

    查询思路：
    先通过salaries join一个取过max的，以emp_no groupby的表，从而得到所有salaries表中是最高工资的所有行，然后join employees

```
select s.emp_no, CONCAT(e.first_name, ' ', e.last_name) AS name, s.from_date, s.to_date, s.salary
from salaries s
join(
    select e.emp_no, MAX(s2.salary) as max_salary
    from employees e left join salaries s2 on e.emp_no = s2.emp_no
    group by e.emp_no
) as ms on  s.salary = ms.max_salary and s.emp_no = ms.emp_no
left join employees e on s.emp_no = e.emp_no
limit 20;


10001,Georgi Facello,2002-06-22,9999-01-01,88958
10002,Bezalel Simmel,2001-08-02,9999-01-01,72527
10003,Parto Bamford,2000-12-01,2001-12-01,43699
10004,Chirstian Koblick,2001-11-27,9999-01-01,74057
10005,Kyoichi Maliniak,2001-09-09,9999-01-01,94692
10006,Anneke Preusig,2000-08-02,2001-08-02,60098
10007,Tzvetan Zielinski,2002-02-07,9999-01-01,88070
10008,Saniya Kalloufi,2000-03-10,2000-07-31,52668
10009,Sumant Peac,2001-02-14,2002-02-14,94443
10010,Duangkaew Piveteau,2001-11-23,9999-01-01,80324
10011,Mary Sluis,1996-01-21,1996-11-09,56753
10012,Patricio Bridgland,2000-12-16,2001-12-16,54794
10013,Eberhardt Terkki,2001-10-16,9999-01-01,68901
10014,Berni Genin,2001-12-27,9999-01-01,60598
```

```
10015,Guoxiang Nooteboom,1992-09-19,1993-08-22,40000
10016,Kazuhito Cappelletti,2002-02-10,9999-01-01,77935
10017,Cristinel Bouloucos,2002-08-01,9999-01-01,99651
10018,Kazuhide Peha,2002-03-30,9999-01-01,84672
10019,Lillian Haddadi,2002-04-29,9999-01-01,50032
10020,Mayuko Warwick,2001-12-29,9999-01-01,47017
```

- 查询所有曾经担任过部门经理(dept_manager)的雇员的编号(emp_no)和姓名(first_name+last_name);

```
select e.emp_no, CONCAT(e.first_name, ' ', e.last_name) AS name
from employees e join
    dept_manager dm on e.emp_no = dm.emp_no

110022,Margareta Markovitch
110039,Vishwani Minakawa
110085,Ebru Alpin
110114,Isamu Legleitner
110183,Shirish Ossenbruggen
110228,Karsten Sigstam
110303,Krassimir Wegerle
110344,Rosine Cools
110386,Shem Kieras
110420,Oscar Ghazalie
110511,DeForest Hagimont
110567,Leon DasSarma
110725,Peternela Onuegbe
110765,Rutger Hofmeyr
110800,Sanjoy Quadeer
110854,Dung Pesch
111035,Przemyslawa Kaelbling
111133,Hauke Zhang
111400,Arie Staelin
111534,Hilary Kambil
111692,Tonny Butterworth
111784,Marjo Giarratana
111877,Xiaobin Spinelli
111939,Yuchang Weedman
```

- 按时间段(from_date,end_data)先后列出每个部门(departments)的编号(dept_no),名称(dept_name),及其经理的姓名(first_name+last_name);

```
select from_date, to_date, d.dept_no, dept_name, CONCAT(e.first_name, ' ', e.last_name) AS name
from dept_manager dm
    left join departments d on dm.dept_no = d.dept_no
    left join employees e on e.emp_no = dm.emp_no
order by dm.from_date;

1985-01-01,1991-10-01,d001,Marketing,Margareta Markovitch
1985-01-01,1989-12-17,d002,Finance,Ebru Alpin
1985-01-01,1992-03-21,d003,Human Resources,Shirish Ossenbruggen
1985-01-01,1988-09-09,d004,Production,Krassimir Wegerle
1985-01-01,1992-04-25,d005,Development,DeForest Hagimont
1985-01-01,1989-05-06,d006,Quality Management,Peternela Onuegbe
1985-01-01,1991-03-07,d007,Sales,Przemyslawa Kaelbling
1985-01-01,1991-04-08,d008,Research,Arie Staelin
1985-01-01,1988-10-17,d009,Customer Service,Tonny Butterworth
1988-09-09,1992-08-02,d004,Production,Rosine Cools
1988-10-17,1992-09-08,d009,Customer Service,Marjo Giarratana
1989-05-06,1991-09-12,d006,Quality Management,Rutger Hofmeyr
1989-12-17,9999-01-01,d002,Finance,Isamu Legleitner
1991-03-07,9999-01-01,d007,Sales,Hauke Zhang
1991-04-08,9999-01-01,d008,Research,Hilary Kambil
1991-09-12,1994-06-28,d006,Quality Management,Sanjoy Quadeer
1991-10-01,9999-01-01,d001,Marketing,Vishwani Minakawa
1992-03-21,9999-01-01,d003,Human Resources,Karsten Sigstam
1992-04-25,9999-01-01,d005,Development,Leon DasSarma
1992-08-02,1996-08-30,d004,Production,Shem Kieras
1992-09-08,1996-01-03,d009,Customer Service,Xiaobin Spinelli
1994-06-28,9999-01-01,d006,Quality Management,Dung Pesch
1996-01-03,9999-01-01,d009,Customer Service,Yuchang Weedman
1996-08-30,9999-01-01,d004,Production,Oscar Ghazalie
```

- 查询所有曾经在'Development'工作过雇员的编号(emp_no),姓名(first_name+last_name),及时间段(from_date,end_data)；
  查询思路：
  通过where筛选出在development工作过的employees，再和employees join 从而筛选出在development工作过的人

```
select e.emp_no, CONCAT(e.first_name, ' ', e.last_name) AS name, develop_emp.from_date, develop_emp.to_date
from employees e
    join (
        select de.emp_no, de.from_date, de.to_date
        from dept_emp de
        left join employees e2 on de.emp_no = e2.emp_no
        left join departments on de.dept_no = departments.dept_no
        where departments.dept_name = 'Development'
) as develop_emp on develop_emp.emp_no = e.emp_no
limit 20

10001,Georgi Facello,1986-06-26,9999-01-01
10006,Anneke Preusig,1990-08-05,9999-01-01
10008,Saniya Kalloufi,1998-03-11,2000-07-31
10012,Patricio Bridgland,1992-12-18,9999-01-01
10014,Berni Genin,1993-12-29,9999-01-01
10018,Kazuhide Peha,1987-04-03,1992-07-29
10021,Ramzi Erde,1988-02-10,2002-07-15
10022,Shahaf Famili,1999-09-03,9999-01-01
10023,Bojan Montemayor,1999-09-27,9999-01-01
10025,Prasadram Heyers,1987-08-17,1997-10-15
10027,Divier Reistad,1995-04-02,9999-01-01
10028,Domenick Tempesti,1991-10-22,1998-04-06
10031,Karsten Joslin,1991-09-01,9999-01-01
10037,Pradeep Makrucki,1990-12-05,9999-01-01
10040,Weiyi Meriste,1993-02-14,2002-01-22
10043,Yishay Tzvieli,1990-10-20,9999-01-01
10048,Florian Syrotiuk,1985-02-24,1987-01-27
10056,Brendon Bernini,1990-02-01,9999-01-01
10057,Ebbe Callaway,1992-01-15,9999-01-01
10062,Anoosh Peyn,1991-08-30,9999-01-01
```

- 查询曾经在所有部门都工作过的雇员的编号(emp_no),姓名(first_name+last_name)；

  说明：
  通过两种查询思路查询出来的结果均为空

```
select number.emp_no
from (select e.emp_no,
            count(dept_no) as number
        from employees e left join dept_emp de
      on e.emp_no = de.emp_no
      group by e.emp_no) as number
where number.number = (select count(1) from departments);

SELECT
    e.emp_no,
    CONCAT(e.first_name, ' ', e.last_name) AS name
FROM
    employees e
WHERE
    NOT EXISTS (
        SELECT
            DISTINCT dept_no
        FROM
            departments
        WHERE
            dept_no NOT IN (
                SELECT
                    de.dept_no
                FROM
                    dept_emp de
                WHERE
                    de.emp_no = e.emp_no
            )
    );
```

- 在dept_emp表中插入适当数据使得至少3个以上雇员满足上一题的查询要求。

查询说明：

通过python加入对应记录，在加入前查询有没有存在已有记录
加入后结果符合预期

```python
import mysql.connector

config = {
    'user': 'root',
    'password': '12345678',
    'host': 'localhost',
    'database': 'db_test',
    'raise_on_warnings': True
}

conn = mysql.connector.connect(**config)
cursor = conn.cursor()

emp_nos = [10001, 10002, 10003]
dept_no_start = 1
dept_no_end = 9

for emp_no in emp_nos:
    dept_no = dept_no_start

    while dept_no <= dept_no_end:
        dept_no_formatted = f'd{dept_no:03}'

        sql_check = "SELECT COUNT(*) FROM dept_emp WHERE emp_no = %s AND dept_no = %s"
        values_check = (emp_no, dept_no_formatted)
        cursor.execute(sql_check, values_check)
        result = cursor.fetchone()

        if result[0] == 0:
            sql_insert = "INSERT INTO dept_emp (emp_no, dept_no, from_date, to_date) VALUES (%s, %s, '2021-01-01', '2022-01-01')"
            values_insert = (emp_no, dept_no_formatted)
            cursor.execute(sql_insert, values_insert)

        dept_no += 1

conn.commit()
conn.close()
```

```sql
select number.emp_no
from (select e.emp_no,
             count(dept_no) as number
        from employees e left join dept_emp de
        on e.emp_no = de.emp_no
        group by e.emp_no) as number
where number.number = (select count(1) from departments);

10001
10002
10003
```

请写出上述每一个查询的SQL语句并将执行结果输出到txt文件中。