作业2: SQL (2020春)

主讲教师: 邹兆年(znzou@hit.edu.cn)

姓名: _____ 学号: _____

题目	1	2	3	4	5	6	7	8	9	10	总分
得分											

1. (10分，每题2分) 判断对错

   (a) SQL语句`DELETE FROM TABLE R`从数据库中删除关系R。

   (b) 将属性声明为`PRIMARY KEY`和`UNIQUE NOT NULL`作用是一样的。

   (c) `ORDER BY A, B DESC`将查询结果按照属性A和B的值降序排列。

   (d) SQL语句`SELECT A FROM R`与关系代数表达式$\Pi_A(R)$的结果相同。

   (e) 若关系R的属性A被声明为`UNIQUE`，则SQL语句`SELECT COUNT(A) FROM R`的结果是$|R|$。

2. (85分，每题5分) 在MySQL上创建Product数据库(Database Systems The Complete Book - Exercise 2.4.1)，然后使用SQL表达下列数据库查询与更新，并在MySQL上验证。

   (a) Find the manufacturers that sell laptops but not PC's. (使用集合差运算)

   (b) Find the manufacturers that sell laptops but not PC's. (使用含有`IN`的嵌套查询)

   (c) Find the manufacturers that sell laptops but not PC's. (使用含有`EXISTS`的嵌套查询)

   (d) Find the model numbers of all printers that are cheaper than the printer model 3002. (使用内连接查询)

   (e) Find the model numbers of all printers that are cheaper than the printer model 3002. (使用含有比较运算符的嵌套查询)

   (f) Find the model numbers of all printers that are cheaper than the printer model 3002. (使用含有`EXISTS`的嵌套查询)

   (g) Find the PC model with the highest available speed. (使用外连接查询)

   (h) Find the PC model with the highest available speed. (使用含有`IN`的嵌套查询)

   (i) Find the PC model with the highest available speed. (使用含有`=`的嵌套查询)

   (j) Find the PC model with the highest available speed. (使用含有`>=`的嵌套查询)

   (k) Find the PC model with the highest available speed. (使用含有`EXISTS`的嵌套查询)

   (l) Find the manufacturers of PC's with at least three different speeds. (使用内连接查询)

   (m) Find the manufacturers of PC's with at least three different speeds. (使用分组查询)

   (n) Find the manufacturers of PC's with at least three different speeds. (使用派生关系)

   (o) Decrease the price of all PC's made by maker A by 10%. (使用含有=的更新条件)

   (p) Decrease the price of all PC's made by maker A by 10%. (使用含有`IN`的更新条件)

   (q) Decrease the price of all PC's made by maker A by 10%. (使用含有`EXISTS`的更新条件)

3. (5分) 第2题(g)中的查询可以用多种SQL语句表示。尝试从语句的易读性和执行效率两方面对2(g)–2(k)的SQL语句进行分析和比较。在做效率分析时，我们假定每个关系上只有主索引，而没有其他索引(请自学索引的概念)。

1. (a) 错

   (b) 错

   (c) 错

   (d) 错

   (e) 错

2. (a)
```
(SELECT DISTINCT maker FROM Product WHERE type = 'laptop') EXCEPT
(SELECT DISTINCT maker FROM Product WHERE type = 'pc');
```
   在MySQL上写成

```
SELECT DISTINCT M1.maker
FROM (SELECT maker FROM Product WHERE type = 'laptop') M1
NATURAL LEFT OUTER JOIN
(SELECT maker FROM Product WHERE type = 'pc') M2
WHERE M2.maker IS NULL;
```

   (b)
```
SELECT DISTINCT maker FROM Product
WHERE type = 'laptop' AND maker NOT IN (
SELECT maker FROM Product WHERE type = 'pc');
```

   (c)
```
SELECT DISTINCT maker FROM Product
WHERE type = 'laptop' AND NOT EXISTS (
SELECT * FROM Product P WHERE P.maker = Product.maker AND type = 'pc');
```

   (d)
```
SELECT P1.model
FROM Printer P1 JOIN Printer P2 ON (P1.price < P2.price)
WHERE P2.model = '3002';
```

   (e)
```
SELECT model FROM Printer
WHERE price < (SELECT P.price FROM Printer P WHERE P.model = '3002');
```

   (f)
```
SELECT model FROM Printer WHERE NOT EXISTS (
SELECT * FROM Printer P WHERE P.model = '3002' AND P.price <= Printer.price);
```

   (g)
```
SELECT PC1.model
FROM PC PC1 LEFT OUTER JOIN PC PC2 ON (PC1.speed < PC2.speed)
WHERE PC2.model IS NULL;
```

   (h)
```
SELECT model FROM PC WHERE speed IN (SELECT MAX(speed) FROM PC);
```

   (i)
```
SELECT model FROM PC WHERE speed = (SELECT MAX(speed) FROM PC);
```

   (j)
```
SELECT model FROM PC WHERE speed >= ALL (SELECT speed FROM PC);
```

   (k)
```
SELECT model FROM PC
WHERE NOT EXISTS (SELECT * FROM PC PC2 WHERE PC2.speed > PC.speed);
```

   (l)
```
SELECT DISTINCT P1.maker
FROM (Product P1 NATURAL JOIN PC PC1)
JOIN (Product P2 NATURAL JOIN PC PC2) ON (P1.maker = P2.maker)
JOIN (Product P3 NATURAL JOIN PC PC3) ON (P1.maker = P3.maker)
WHERE PC1.speed != PC2.speed AND PC2.speed != PC3.speed AND PC1.speed != PC3.speed;
```

   (m)
```
SELECT maker FROM Product NATURAL JOIN PC
GROUP BY maker HAVING COUNT(DISTINCT speed) >= 3;
```

   (n)
```
SELECT R.maker
FROM (SELECT maker, COUNT(DISTINCT speed) cnt
FROM Product NATURAL JOIN PC GROUP BY maker) R
WHERE R.cnt >= 3;
```

   (o)
```
UPDATE PC SET price = price * 0.9
WHERE 'A' = (SELECT maker FROM Product WHERE Product.model = PC.model);
```

(p)
```
UPDATE PC SET price = price * 0.9
WHERE model IN (SELECT model FROM Product WHERE maker = 'A');
```

(q)
```
UPDATE PC SET price = price * 0.9
WHERE EXISTS (SELECT * FROM Product WHERE maker = 'A' AND Product.model = PC.model);
```

3. 在SQL语句易读性方面，(i)最好，(h)和(j)次之，(g)和(k)最差。在效率方面，由于在speed上没有索引，(g), (j), (k)的效率最差；(h)和(i)需要对PC进行2遍扫描，效率高一些。