北 京 交 通 大 学 考 试 试 题（A 卷）

数据库系统（2013-6-24）

I. single choice（15points）

Please write your answer in this table, otherwise invalid.

No.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Answer	c	c	b	a	a	c	b	b
No.	(9)	(10)	(11)	(12)	(13)	(14)	(15)	
Answer	a	a	b	a	a	d	c	

II. Fill in blanks (20 points, 2points/blank)

Please write your answer in this table, otherwise invalid.

No.	(1)	(2)	(3)	(4)	(5)
answer	fail	improve	physical data independence	Logical design	Physical design
No.	(6)	(7)	(8)	(9)	(10)
answer	Non-repeatable Read	Shared or S or read	Graphs	Isolation	Limit, reduce, decrease

III. (25 points)

1. (7 points) Design a trigger or two triggers that can update the corresponding value of Total_credits in table S after inserting or deleting a certain course in table SC .

Answer :

SQL Server:

```
CREATE TRIGGER delete_sc    ON sc (4 points)
FOR delete
AS
   update s
   set Total_credits= Total_credits-
         (select credit
          from deleted d,c
          where d.cno=c.cno)
```

```
    where s.sno=( select sno from deleted)
CREATE TRIGGER insert_sc    ON sc      (3 points)
FOR INSERT
AS
update s
   set Total_credits= Total_credits+
          (select credit
            from inserted i,c
            where i.cno=c.cno)
where s.sno=( select sno from inserted)
```

Oracle:

```
Create or replace trigger changecredit
After insert or delete on sc
For each row
Declare
      V_credit c.credit%type;
Begin
   If inserting then
      Select credit into v_credit from c where cno=:new.cno;
      Update s set total_credits=total_credits+v_credit where sno=:new.sno;
   Else deleting then
      Select credit into v_credit from c where cno=:old.cno;
      Update s set total_credits=total_credits-v_credit where sno=:old.sno;
   End if;
End;
```

2. (3 points) Modify table S add a constraint to restrict that male's age must be less than 23 or female's age must be less than 21.

Answer :

```
Alter table s add constraint ck check((sex='M' and age<23) or (sex='F' and age<21));
```

3. (5points) Delete the tuples of all female students whose grades of Database course are less than 60 from Table SC

Answer：

```
Delete from sc
Where grade<60
    and cno in (select cno from c where cname='database')
    and sno in (select sno from s where sex='female');
```

4. (5 points) $\pi_{sname}(S \bowtie (\pi_{sno,cno}(SC) \div \pi_{cno}(C)))$

Please write the equivalent SQL statement for the above relational algebra expression to implement the same function.

Answer：

```
select sn    from s where not exists
    ( select * from c where not exists
        （select *from sc where s.sno=sc.sno and sc.cno=c.cno))；
```

5. (5 points) Search for all tuples in table sc whose grades are more than the average grade of the same course.

```
select *    from sc sc1
where grade>(select avg(grade) from sc sc2
                where sc2.cno=sc1.cno)
```

IV. （12 points）Please give out the set of functional dependency for each relation schema, specify all candidate keys of each relation and the highest normal formal to which the following relation belongs to. Please write your reasons.

1. **Solution:**

F1= { SJ→P, JP→S } ---------- (2 points)

CK1= (S, J) CK2= (J, P) ---------- (2 points)

R1∈BCNF,

because for each dependency, the left side is a candidate key.

---------- (2 points)

2. **Solution:**

F1= { T→J, SJ→T } ---------- (2 points)

CK1= (S, T) CK2= (S, J) ---------- (2 points)

R2∈3NF , because there is no non-primary-key attribute

and for T→J, the left side is not a candidate key,

so it is not in BCNF.---------- (2 points)

V. (13points) Please answer the following questions briefly.

1. Please tell the difference between Equi-join and Natural join.

(1) Equijoin does not require that the names of two compared attributes be the same, but Natural join does. ---------- (2 points)

(2) The result of Equijoin keeps all the duplicate names of common attributes, but that of Natural join does not. ---------- (2 points)

2. Potential to violate BCNF in 3NF may occur in a relation that:

(1) A relation contains two (or more) composite candidate keys; ------ (2 points)

(2) The candidate keys overlap (i.e. have at least one attribute in common). -- (2 points)

3. Two concurrent transactions are scheduled as follows. Please tell whether it is a serializable schedule and give the reason.

There are two cases of serial schedules. The results are as follows

Case 1: T1->T2, F=1,G=0,H=1

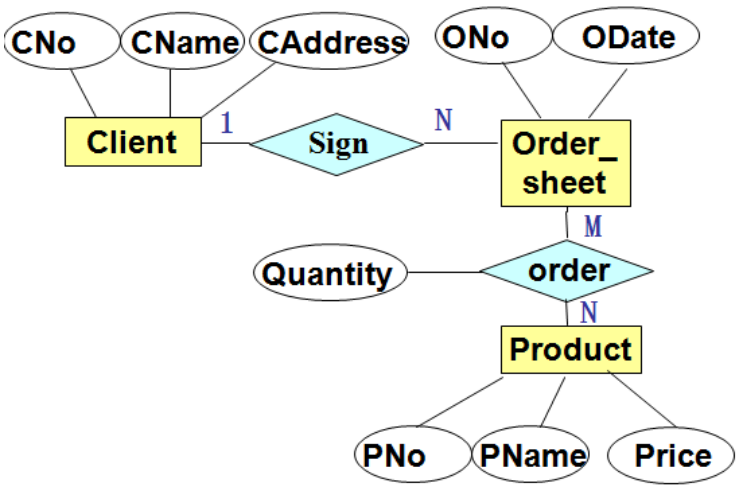
Case 2: T2->T1, F=1,G=0,H=2 ------ (2 points)

The result of concurrent schedule: F=1,G=0,H=1, the same with that of case 1. ---------- (1 points)

So it is **serializable schedule.** ------ (2 points)

VI. Database Design (15 points)

E-R Diagram：



每个实体及其属性 1 分，每个联系 2 分，共 7 分

Client（<u>CNo</u>，CName，CAdrress） ----------（2 分）

Product（<u>PNo</u>，PName，Price）----------（2 分）

Order_Sheet（<u>ONo</u>，CNo，ODate）----------（2 分）

Order（<u>ONo，PNo</u>，Quantity）

<PK>=（<u>ONo，PNo</u> ），<FK1>=ONo，<FK2>=<u>PNo</u> ----------（2 分）