浙江大学 2017－2018 学年 春夏 学期

《数据库系统》课程期末考试试卷（A 卷）

参考答案及评分细则

Answers of Problem 1：
(12 points, 3 points per part)

（1）

```
select  c1.cno, c1.name
from    (card as c1) natural join (detail as d1),
          detail as d2
where c1.depart= 'CS' and d2.cno ='c0002' and
        d1.cdate = d2.cdate and d1.pno=d2.pno;
```

another answer:

```
select    c1.cno, c1.name
from      card as c1, detail as d1, detail as d2
where     c1.cno=d1.cno and
          c1.depart= 'CS' and d2.cno ='c0002'
          d1.cdate = d2.cdate and d1.pno=d2.pno;
```

评分细则：
每个 where 条件错扣 1 分，select 错扣 1 分，直至扣完

（2）

$$\Pi_{c1.cno,\ c1.name}\ (\sigma_{d1.cdate=d2.cdate\ \wedge\ d1.pno=d2.pno}\ (\ (\sigma_{c1.depart='CS'}(\rho_{c1}(card))) \bowtie \sigma(\rho_{d1}(detail)) \times (\sigma_{d2.cno='c0002'}(\rho_{d2}(detail)))\ )\ )$$

（3）

```
select cno
from detail natural join pos
where year(detail.cdate)=2018
group by cno
having count(distinct campus)=1;
```

another answer:

```
select *
from card c1
where exists(
            select *
```

```
            from (detail natural join pos) as r1
            where r1.cno=c1.cno )
    and not exists(
            select *
            from    (detail natural join pos) as r1,
                    (detail natural join pos) as r2
            where   r1.cno=c1.cno and r2.cno=c1.cno and
                    year(r1.cdate)=2018 and year(r2.cdate)=2018
                    and r1.campus<> r2.campus
            )
```

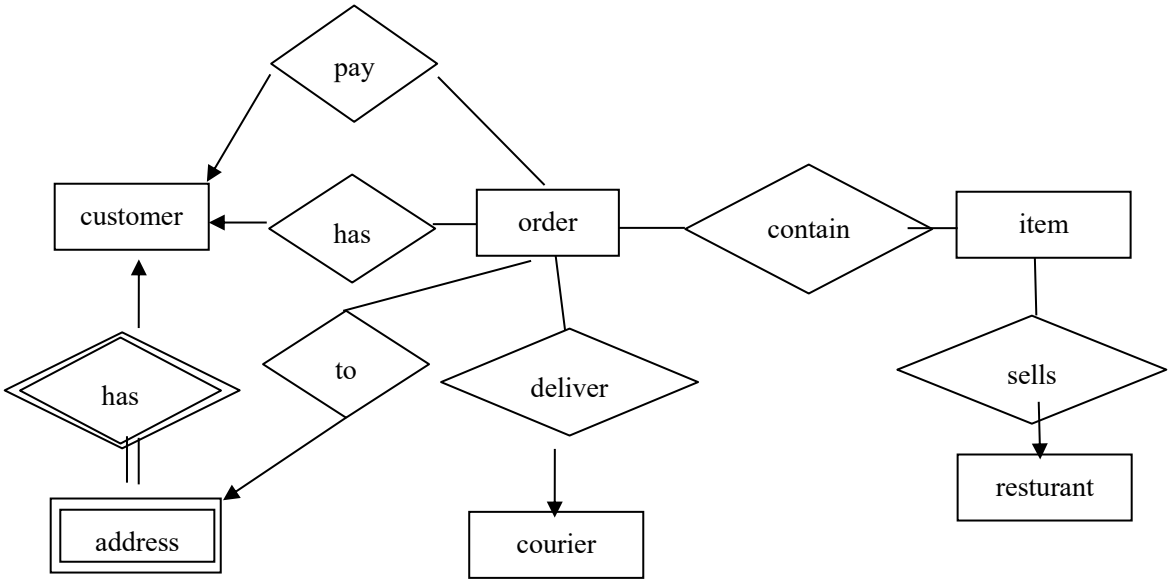
（4）

```
select cno
from detail natural join pos
where pos.campus='紫金港' and year(detail.cdate)=2018
group by pno
having sum(amount)>=all (
    select sum(amount)
    from detail natural join pos
    where pos.campus='  紫金港' and year(detail.cdate)=2018
    group by pno
)
```

（5）

```
update card set balance = balance -20 where cno='c0002';
insert into detail(cno, pno, cdate, ctime, amount)
            values('c0002', 'p001','2018-07-02', '08:08:08', 20);
commit;
```

Answers of Problem 2：
（11 points)



Answers of Problem 3：
(12 points, 3 points per part)

(1) Fc={A→C, C→B, B→DE}

(2) $(B)^+$ = (B,D,E)

(3) R1(B,D,E), F1={B→DE}
R2(C,B), F2={C→B}
R3(A,C), F3={A→C}

(4) The decomposition is dependency preserving,
because (F1∪F2∪F3)+ = F+

Answers of Problem 4：
(12 points, 4 points per part)

（1）<campus_cards>
<pos pno=”p003”>
<campus> 玉泉 </campus>
<location> 四食堂 </location>
</pos>
<card cno=”c0003” >
<name> 王浩<name>
<depart> CS </depart>
<balance> 300<balance>
<detail pno=” p003”>
<cdate> 2018-07-03</cdate>
<ctime> 08:10:10 </ctime>
<amount>25 </amount>
<remark>餐饮<remark>
</detail>
</card>
</campus_cards>

（2）
/campus_cards/card[name=”张帅”]/detail[amount=50] /id(pno) /location/text()

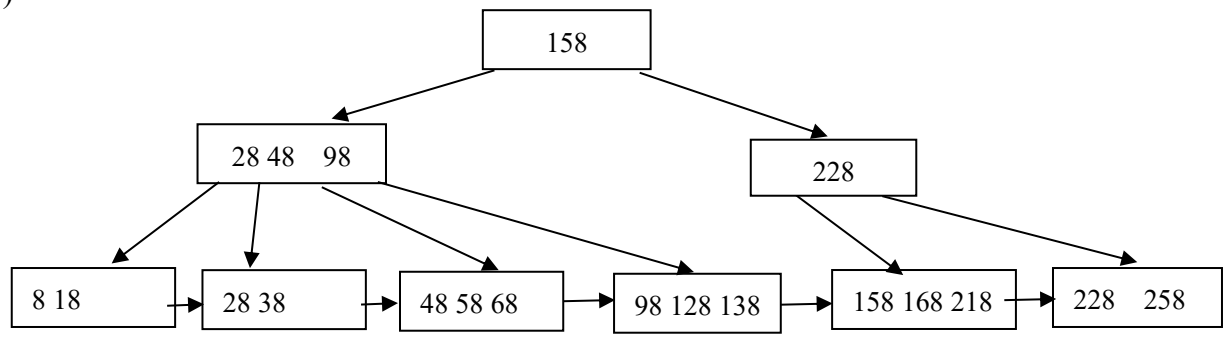
(3)

```
for $x in /campus_cards/card/detail
    $y in /campus_cards/card[name=”张帅”]/detail
where $x/@pno=$y/@pno and $x/cdate=$y/cdate and
        $x/@cno<>$y/@cno
return   <cno> {$x/cno } </cno>
```

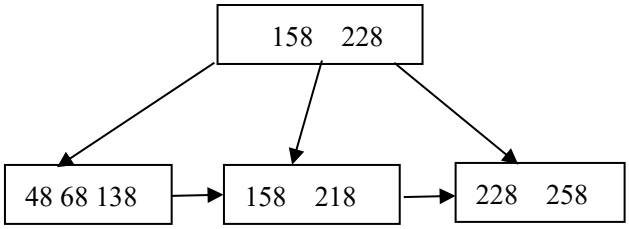
Answers of Problem 5:

(12 points, 4 points per part)

1)



2)



3）3+2+2+1=8

Answers of Problem 6:

(16 points, 4 points per part)

1) (10000000*10000000) / (100 * 365)) *3/12 = 684.93M

2) Record number per block of card=4096/25=163
   Blocks of card = 10000/163=61.3→62
   Record number per block of detail=4096/29=141.24 →141
   Blocks of detail = 10000000/141=70922

3) Fan-out rate n of the B+-tree =(4096-4)/(5+4) +1 = 455
4) Min height of B+tree = $\log_{455}$（10000） → 2（向上取整）
   Max height of B+tree = $\log_{228}$（10000/2）+1= →2（向下取整）
   So height of B+tree = 2

5) Cost for evaluating **σ operation （2分，各1分）**
   block transfer = 62 t_T
   seek time =1 t_S

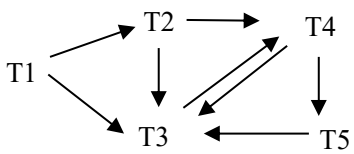
   cost for the natural join operation（2分，t_S 和 t_T各1分）
   return number of σ name='张帅' (card) = (10000/5000)=2
   block number for each card cno in detail = (10000000/10000)/141 = 7.09 =8

   cost for the natural join operation = 2*(2 t_S +2 t_T +1 t_S +8 t_T)
   =2*(3 t_S +10 t_T) = 6 t_S +20 t_T
   pipeline evaluation:
   Total cost =（1 t_S +62 t_T）+（6 t_S +20 t_T） = 7 t_S +82 t_T

Answers of Problem 7:

(12 points，3 points per part)

1)



2）
S is not serializable，because there are cycles in the graph ：T3~T4~T3；

T3~T4~T5~T3

3）no，because every schedule generated by 2PL is serializable.

4）w3(B) ， or w4(B)，， or w3(C)

Answers of Problem 8:

(10 points, 2 points per part)

1) 1006 （2分）
2) 1005 （2分）
3)

PageID	PageLSN	RecLSN
8001	1010	1010
8002	1014	1006
8003	1015	1015

4) “8002.1” = 55（1分）
“8002.2” = 99（1分）

5)

1017： <T3, 8002.1, 66>
1018： <T3, 8002.1, 55>
1019： <T3 abort>