

# 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

#### 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;**

(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 pno
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
)

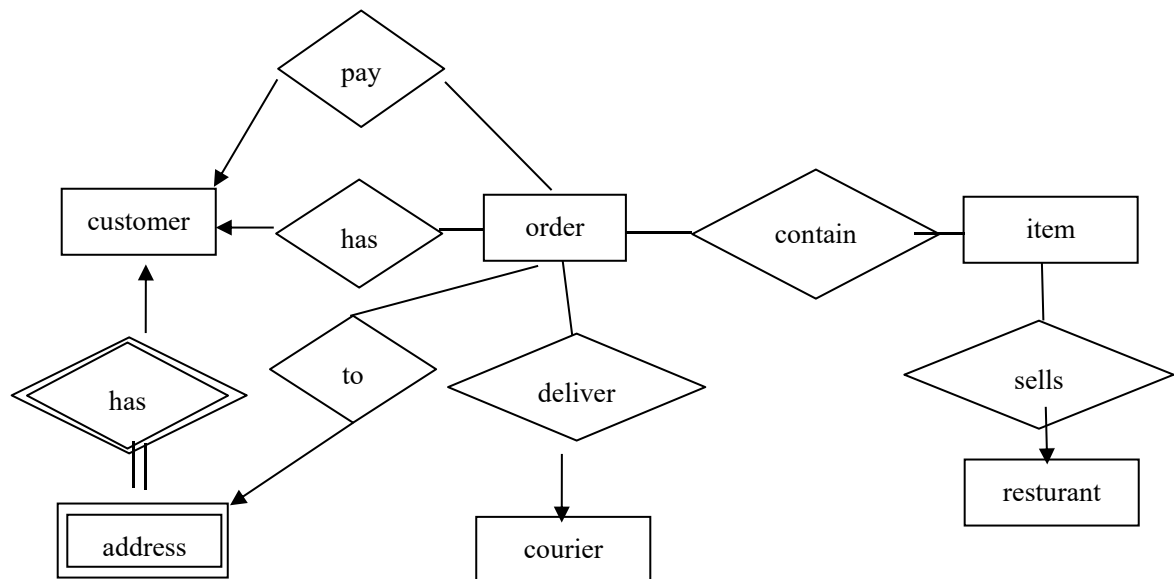
```
- (5)
- ```

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)  $F_c = \{A \rightarrow C, C \rightarrow B, B \rightarrow DE\}$

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

(3)  $R_1(B, D, E), F_1 = \{B \rightarrow DE\}$

$R_2(C, B), F_2 = \{C \rightarrow B\}$

$R_3(A, C), F_3 = \{A \rightarrow C\}$

(4) The decomposition is dependency preserving,  
because  $(F_1 \cup F_2 \cup F_3)^+ = F^+$

**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()  
评分细则:

(3)

```

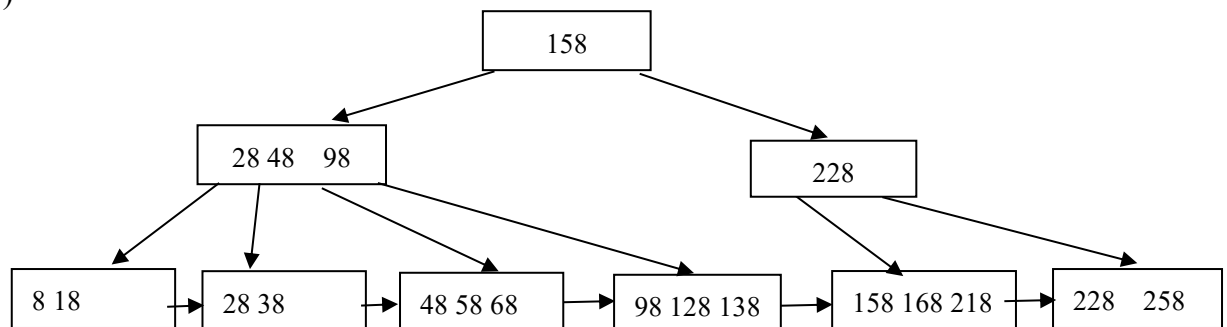
for $x in /campus_cards/card/detail
  $y in /campus_cards/card[name="张帅"]/detail
where $x/@pno=$y/@pno and $x/cdate=$y/cdate
return  <cno> {$x../@cno } </cno>

```

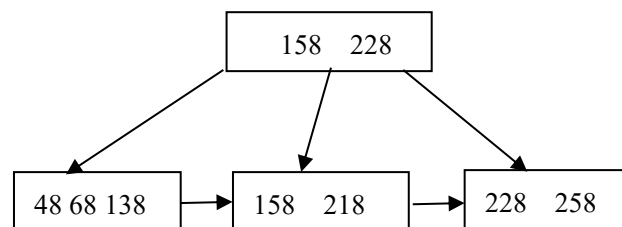
### Answers of Problem 5:

(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 =  $10000 / 163 = 61.3 \rightarrow 62$

Record number per block of detail =  $4096 / 29 = 141.24 \rightarrow 141$

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 =  $\log_{455} (10000) \rightarrow 2$  (向上取整)

Max height of B+tree =  $\log_{228} (10000 / 2) + 1 = \rightarrow 2$  (向下取整)

So height of B+tree = 2

5) Cost for evaluating  $\sigma$  operation (2分, 各1分)

block transfer =  $62 t_r$

seek time =  $1 t_s$

cost for the natural join operation (2分,  $t_s$  和  $t_r$  各1分)

return number of  $\sigma$  name='张帅' (card) =  $(10000 / 5000) = 2$

block number for each card cno in detail =  $(10000000/10000)/141 = 7.09 \approx 8$

cost for the natural join operation =  $2*(2 t_S + 2 t_T + 1 t_S + 8 t_T)$   
 $= 2*(3 t_S + 10 t_T) = 6 t_S + 20 t_T$

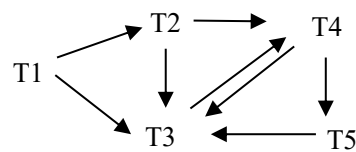
pipeline evaluation:

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) 评分细则:



2)

S is not serializable, because there are cycles in the graph :  $T3 \sim T4 \sim T3$ ;  
 $T3 \sim T4 \sim T5 \sim T3$

3) no

4)  $w3(B)$  , or  $w4(B)$  , , or  $w3(C)$

### Answers of Problem 8:

(10 points, 2 points per part)

1) 1006

2) 1005

3)

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

4) “8002.1” = 55

“8002.2” = 99

5)

1017: <T3, 8002.1, 66>

1018: <T3, 8002.1, 55>

1019: <T3 abort>