北京邮电大学 2009——2010 学年第 2 学期

《数据库系统原理》期中考试试题

考试注意事项	一、学生参加考试须带学生证或学院证明，未带者不准进入考场。学生必须按照监考教师指定座位就坐。 二、书本、参考资料、书包等物品一律放到考场指定位置。 三、学生不得另行携带、使用稿纸，要遵守《北京邮电大学考场规则》，有考场违纪或作弊行为者，按相应规定严肃处理。 四、学生必须将答题内容做在试题答卷上，做在试题及草稿纸上一律无效。 五、填空题用英文答，中文答对得一半分。										
考试课程				考试时间		2010 年 5 月 6 日					
题号	一	二	三	四	五	六	七	八	九	十	总分
满分											
得分											
阅卷教师											

1. Fill in blanks. (3×3 points)

(1) DDL is the language for specifying the database schema and as well as other properties of the data.

(2) With respect to integrity mechanisms in DBS, trigger defines actions to be executed automatically when some events occur and corresponding conditions are satisfied.

(3) An entity set that does not have sufficient attributes to form a primary key is termed a weak entity set.

2. Choice (7×3 points)

(1) With respect to DBS design, the index is designed at the BD .phase.

A. requirement analysis B. conceptual design

C. logical design D. physical design

(2) For the E-R diagram given below, the mapping cardinality from *A* to *B* is C

A. one-to-many B. one-to-one C. many-to-one

D. many-to-many

(3) The following SQL statement corresponds to the expression C.

Select *

From *r, s*

A. $r \cap s$ B. $r \infty s$ C. $r \times s$ D. $r - s$

(4) Given the schema R(A, B, C, D, E, F) and the functional dependencies F={AB→D, BC→E, D →F,

AB→ F, CE→B} holding on it, D is a transitive functional dependency.

A. AB→D B. BC→ E C. D →F D. AB→F

E. CE→B

(5) Given a relation *r*(R), which one of the following functional dependencies is satisfied by *r*. C

A. A→B B. AC→B C. BC→A

D. B→C E. none

A	B	C
1	6	2
4	5	6
4	6	6
7	3	8
9	1	0

(6) In a *Select* statement, C can be used to take out repetition tuples.

A. unique B. count C. distinct D. union

(7) All information except D belong to meta-data and are stored in the data dictionary.

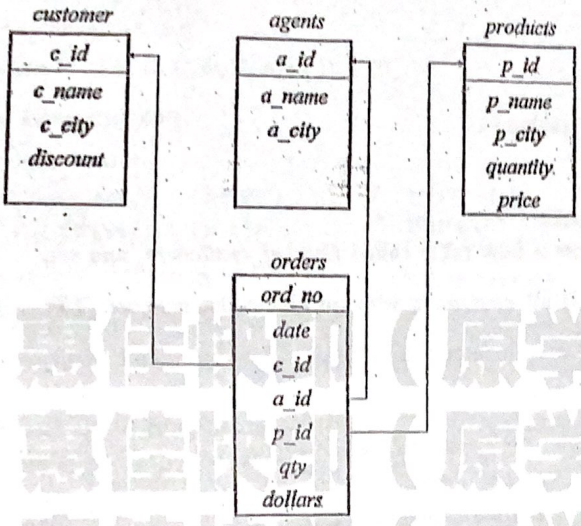
A. names of the relations

B. names of the authorized users

C. attributes on which the index is defined

D. tuples in the relations

3. Here is the schema diagram for CAP database. Some definitions for the attributes in the table *customer*, *agents*(代理商), *products*, and *orders*(订单) are also given in the following list. The *customers* order *products* from the *agents*. Each time an *order* is placed, a new row is inserted into the *orders* table. (28 points).



attributes	data types	definitions
c_id	int	unique identifier for the *customer*; similar definitionss for *a_id*, *p_id*, *ord_no*
c_name	varchar(10)	name of the *customer*; similar definitions for *a_name* and *p_name*
c_city	varchar(10)	city where the *customer* is located; similar definitions for *a_city* and *p_city*
discount	real	each *customer* has a negotiated discount (折扣) on prices
quantity	real	quantity of the *product* on hand for sale, in standard units
price	real	price of each unit product
o_date	date	the year and month the *order* was paced
qty	real	the total quantity ordered for the *product*
dollars	real	the cost for the ordered *product* in this order

Use the SQL statements to implement the following operations:

(1) Define the table *orders*, it is assumed that the *null* value is inappropriate for the attribute *qty* and the attribute *dollars* ranges from 100 to 10,000. (7 points)

```
creat table orders
    (odate  date,
     c_id   int,
     a_id   int,
     p_id   int,
     qty    real not null,
     dollars real not null,
     primary key (ord_no),
     foreign key (c_id) references customer(c_id),
     foreign key (a_id) references agents(a_id),
     foreign key (p_id) references products(p_id),
     check (dollars>=100 and dollars<=10000))
```

(2) Find out the *name* of each *customer* who orders all his *products* through only one *agent*. (7 points)

```
Select  c_name
from    customer
where   c.id  in ( select  c_id
                    from    order
                    group   by  c_id
                    having  count ( distinct  a_id) = 1 )
```

(3) Give every *customer*, who places some *orders* and the total cost (in *dollars*) of all these *orders* is more than $2000, a 10% increase in the *discount* he receives. (7 points)

```
update   customer
set      distinct (1+10%)* discount
where    c_id  in  (select  c_id
                    from    orders
                    group   by  c_id
                    having  sum ( dollars) > 2000 )
```

(4) Create a new table called *Huabei_customers*, and add into it all *customers* who purchase the *product* "TV" and are located in Beijing, Tianjing and Shijz. (7 points)

```
creat  table  Huaber_customer
(   c_id    int,
    c_name  varchar(10),
    c_city  varchar(10),
    discount  real,
    primary  key (c_id))

insert  into  Huaber_customer
    Select  customer*
    from  customer, products, orders
    where (( customer. c_id = orders. c_id) and
          (products. p_id = orders. p_id) and
          (p_name = 'T.V') and ((c_city = 'Beijing') or (c_city = 'Tianj' or (c_city = 'Shijz')
```

4. (20 points) The functional dependency set F={ AB→C, A→DEI, B→FH, F→GH, D→IJ } holds on the relation

F={AB→C, A→DEI, B→FH, F→GH, D→IJ}

schema R = (A, B, C, D, E, F, G, H, I, J),

a. Compute $(AF)^+$ (5 points)

1. result = (AF)⁺
2. result = ADEIF (A→DEI)
3. result = ADEFIJ (D→IJ)
4. result = ADEFGHIJ (F→GH)
5. ∴ $(AF)^+$ = ADEFGHIJ

1. result = (AF)⁺
2. result = (ADEIFGH) (A→DEI, F→GH)
3. result = (ADEFGHIJ) (D→IJ)
∴ $(AF)^+$ = ADEFGHIJ

b. List all the candidate keys of R. (5points)

AB

{A, B}

c. Compute the canonical cover F_c (5 points)

AB→C and A→DEI with AB→CDEI
AB→C and B→FH with AB→CFH
AB→CDEI and AB→CFH with AB→CDEFHI

① AB→C, (A)⁺不包含C, (B)⁺不包含C, A,B对C无冗余性

② A→DEI, (A)⁺包含I, I是无冗余性

③ B→FH, (B)⁺包含H, H是无冗余性

④ F→GH, D→IJ 无冗余

∴ F_c = {AB→C, A→D, B→F, F→GH, D→IJ}

d. Give a lossless and dependency-preserving decomposition of R into 3NF. (5 points)

A→DEI (A→D, A→E) 传递依赖
B→FH (B→F, B→H) 传递依赖
F→GH
D→IJ

A→D, D→IJ

R_1(A, B, C)
R_2(A, D, E)
R_3(B, F)
R_4(F, G, H)
R_5(D, I, J)

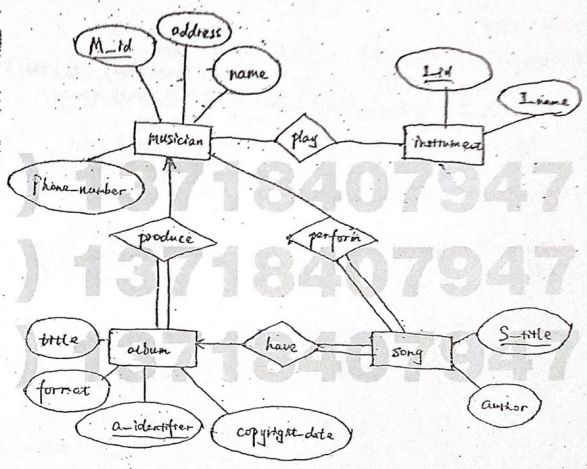
5. (22 points) Notown Records company needs to store information about songs, albums and musicians who perform on its albums in a database. Consider the following information:

- **Each musicians that records at company has an Id (which is unique), a name, an address, and a phone number.**
- **Each instrument used in company has a name and an ID, ID is unique.**

- Each album recorded on the Notown label has a title, a copyright date, a format, and an album identifier.
- Each song recorded at Notown has a title and an author, and each song can be identified by title.
- Each musician may play several instruments, and a given instruments may be played by several musicians.
- Each album has a number of songs on it, but no song may appear on more than one album.
- Each song is performed by one or more musicians, and a musician may perform a number of songs.
- Each album has exactly one musician who acts as its producer. A musician may produce several albums, of course.

(1) Design the E/R diagram for hospital database on basis of the information mentioned above.(11 points)

Note: mapping cardinality of each relationship and participation of each entity to the relationship should be described in the diagram.



(2) Convert the E-R diagram to the proper relational schemas, and give the primary keys of each relation schemas by underlines. (11 points)

musician (M_id, name, address, phone_number)

instrument (I_id, I_name)

album (a_identifier, title, copyright_date, format, m_id)

song (S_title, author, a_identifier)

play (m_id, I_id)