1. Fill in blanks. (1×9 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__________.

(4) The commonly-used schemes of organization of records in files are __heap file organization__, sequential file organization, and hashing file organization.

(5) The three steps in query processing are parsing and translation, optimization, and evaluation_________.

(6) The recovery-management component of a database system implements the support for transaction atomicity and__durability__.

(7) A__cascadeless___schedule ensures that the abort of a transaction does not result in cascading aborts of other transactions.

(8) The __stric__ two-phase lock protocol requires that all exclusive-mode locks taken by a transaction be held until that transaction commits.

(9) The three types of failures in DBS are the transaction failures, system crash, and __disk failures/crash__.

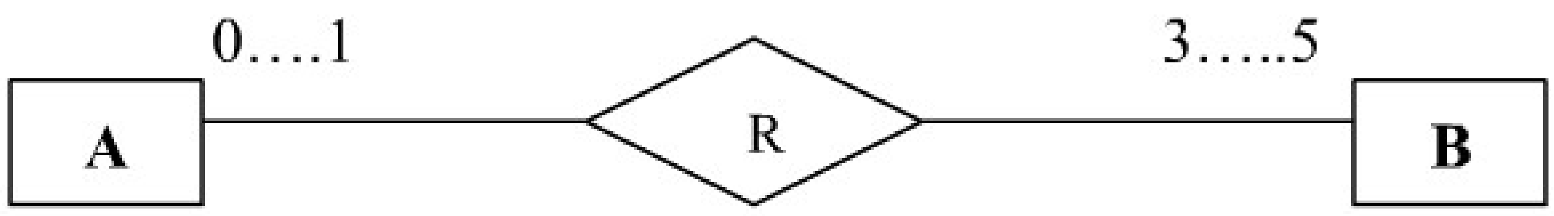
2. Choice (1×11 points)

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

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 pacled
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. (4 points)

(2) Find out the *name* of each *customer* who orders all his *products* through only one *agent*. (5 points)

(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. (5 points)

(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. (4 points)

Answer:

(1) create table orders(

```
ord_no   int,
o_date   date,
c_id     int,
a_id     int,
p_id     int,
```

```
    qty        real       not null,
    dollars    real,
    primary key (ord_no),
    foreign key (c_id) references customer,
    foreign key (a_id) references agents,
    foreign key (p_id) references products,
    check (dollars between 100 and 10000))
```

(2) 解法一：

```
select c_name
from customer,orders
where customer.c_id = order.c_id
group by c_id,c_name
having count(distinct a_id ) = 1
```

解法二：

```
select c_name
from (select distinct customer. c_name,count (orders.a_id) as agent_number
        from customer,orders
        where customer.c_id = orders.c_id
        group by orders.c_id)
where agent_number = 1
```

解法三：

```
with cAgent(c_id,a_num) as
    select c_id,count (distinct a_id)
    from orders
    group by c_id
select c_name
from customer, cAgent
where customer.c_id = cAgent.c_id and cAgent.a_num = 1
```

(3) update customer

```
set discount = discount * 1.1
 where c_id in (select c_id
                    from orders
                    group by c_id
                    having sum (dollars) > 2000)
```

(4) 解法一：

```
create table Huabei_customers(
        c_id       int,
        c_name     varchar(10),
        c_city     varchar(10),
        discount   real;
        primary key (c_id)
insert into Huabei_customers
    select customer.c_id ,c_name,c_city,discount
    from customer,orders,products
    where customer.c_id = orders.c_id and products.p_id = orders.p_id
   and p_name = 'TV'and p_city in{'Beijing','Tianjing','Shijz'}
```

解法二：

```
create table Huabei_customers(
        c_id       int,
        c_name     varchar(10),
        c_city     varchar(10),
        discount   real;
        primary key (c_id)
 select customer.c_id ,c_name,c_city,discount    into Huabei_customers
 from customer,orders,products
```

where customer.c_id = orders.c_id and products.p_id = orders.p_id

and p_name = ‘TV’and p_city in (‘Beijing’,’Tianjing’,’Shijz’)

4. **(12 points)** The functional dependency set F={ AB→C, A→DEI, B→FH, F→GH,D→IJ }

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

a. Compute $(AF)^+$ (3 points)

b. List all the candidate keys of R. (2points)

c. Compute the canonical cover F_c (3 points)

d. Give a lossless and dependency-preserving decomposition of R into 3NF. (4 points)

Answer:

a. （3 points）

(AF)+ result=AF

A→DEI result=AFDEI

F→GH result=AFDEIGH

D→IJ result=AFDEIGHJ

b.(2 points)

(AB) + =ABCDEFGH

c. (3 points)_

Fc={ AB→C , A→DE, B→F, F→GH , D→IJ }

d. (4 points)

R1(A,B,C)

R2(A,D,E)

R3(D,I,J)

R4(B,F)

R5(F,G,H)

5. **(20 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.

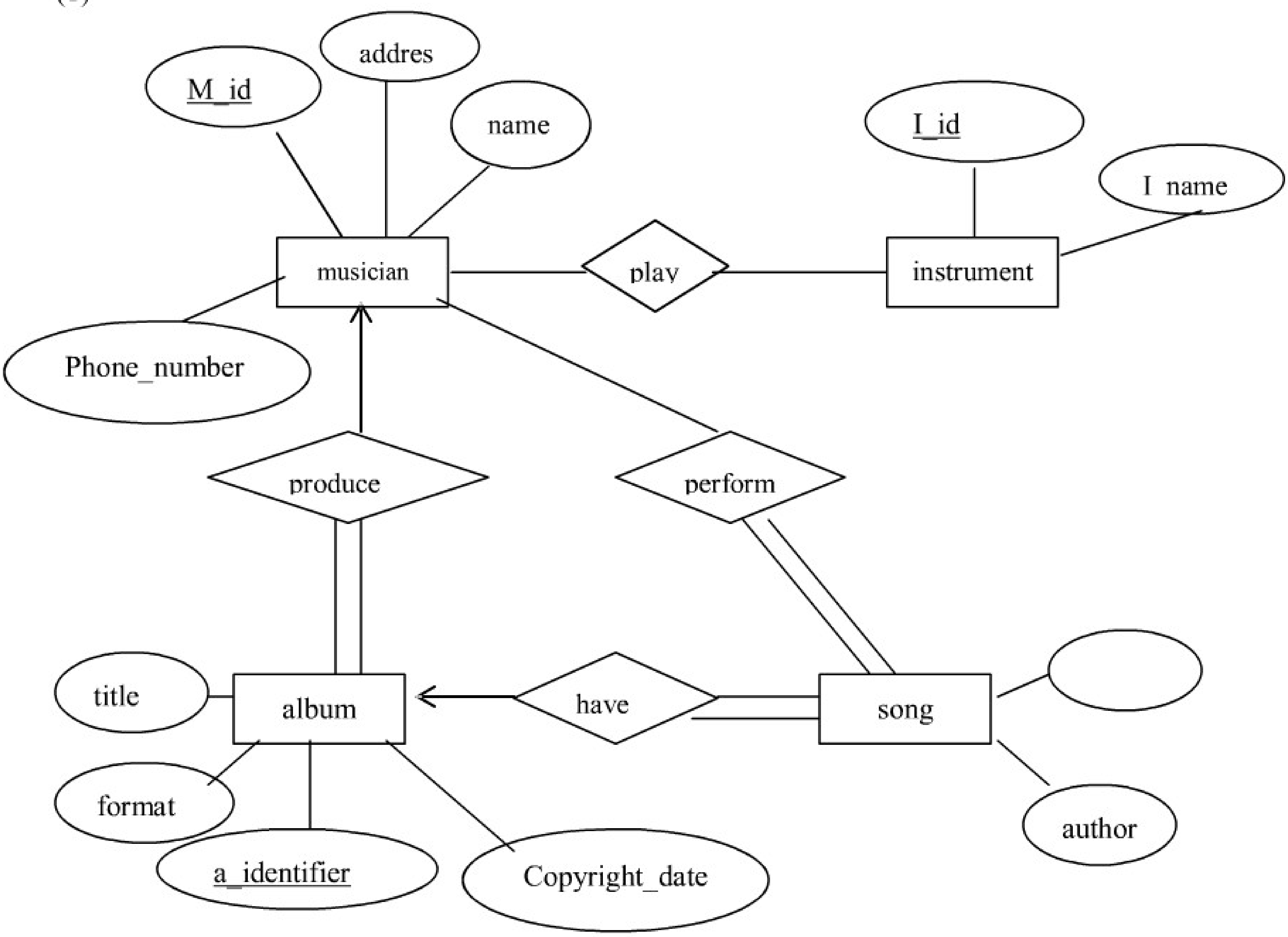
(1) Design the E/R diagram for hospital database on basis of the information mentioned above .(10 points)

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. (10 points)

Answers：

(1)



全参与和部分参与可有不同答案。

(2) 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(<u>m_id, I_id</u>)

perform(<u>m_id, s_title</u>)