北京交通大学　软件学院 2012 级

2013—2014 学年　第二学期期末考试试题(2014-05-21)

课程名称：　数据库系统 (A)　　出题教师：　王方石 冯凤娟

专业：　软件工程　　班级:_____　　姓名:_____　　学号:_____

题号	一	二	三	四	五	六	七	总分
得分								
阅卷人								

答案写在指定的答题处，否则无效

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1. Please choose the best one answer in 4 items. （**2 points*15=30**）

(1) Which of the following functional dependency diagrams accurately represents the following situation？ _____

· One campus has many buildings. Each building has a unique name.
· Each building has many rooms. Each room is assigned to a single department.
· All rooms in any given building are numbered sequentially starting at "101".
· Each room has a certain capacity although many rooms in the same building or Different buildings may have the same capacity.·
· A department may have many rooms in one or more buildings, each with the same or different capacities.

(a) (BuildingName, Capacity) → (Department, RoomNumber)
(b) (Department, Capacity) → (BuildingName, RoomNumber)
(c) RoomNumber → (BuildingName, Department, Capacity)
(d) BuildingName → (RoomNumber, Capacity, Department)
(e) (BuildingName, RoomNumber) → (Capacity, Department)

(2) For two tables to be union compatible, which of the following should be the same for both tables?
(a) cardinality　(b) degree　(c) name　(d) keys

(3) In a database system, whose responsibility is to provide data consistency?
(a) the DBMS's　(b) the database administrator's
(c) the application programmer's　(d) the user's

(4) When a transaction functions in such a way that either all of the transaction actions are completed or none of them will be, the transaction is said to be: _____
(a) atomic.　(b) logical.　(c) isolated.　(d) consistent.　(e) locked.

(5) Whether a lock applies to data at the record level, page level, table level, or database level is referred to as: _____
(a) serializable locking.　(b) lock granularity.　(c) lock exclusivity.
(d) lock sharing.　(e) lock phasing.

(6) Indexing a database table _____ improve(s) query performance when the table has _____ quantities of data.

(a) always, small (b) might not, small (c) never, large (d) cannot, large

(7) A point of synchronization between the database in hard disk and the transaction log is called a(n): _____

(a) after-image. (b) recovery. (c) checkpoint. (d) before-image. (e) none of the above.

(8) The undo action undoes the effects of a(n) _____ transaction, and the redo action redoes the effects of a(n) _____ transaction.

(a) aborted, aborted (b) aborted, committed

(c) committed, aborted (d) committed, committed

(9) The term physical data independence refers to the ability to change

(a) the data without physically relocating the tables

(b) the physical layout of the data without changing the external schemas, the conceptual schemas, or the application programs

(c) the conceptual schema without changing the application programs

(d) the application programs without changing the conceptual schema

(10) When removing a table from the schema, using the RESTRICT option would

(a) recursively remove the table and all other tables that the removed table refers to

(b) remove the table and all other tables that the specified table refers to

(c) remove the table and all references to it

(d) remove the table if there are no references to it

(11) Which of the following is true about updateability of views?

(a) A view is updateable under all circumstances.

(b) A view is not updateable under any circumstance.

(c) A view is not updateable if it involves one table and contains a key.

(d) A view is not updateable if it involves aggregate functions and nested queries.

(12) A deadlock occurs when

(a) a transaction is aborted and restarted repeatedly

(b) an aborted transaction holding a lock is restarted

(c) a transaction holding a lock is aborted

(d) 2 or more transactions wait indefinitely because each holds the data items of another

(13) An exclusive lock on a data item represents permission to perform which of the operations, read and write, on the data item?

(a) Both read and write (b) Write only (c) Neither read nor write (d) Read only

(14) Consider a table with atomic attributes A, B, and C and the following functional dependencies.A -> B B -> C If the primary key of this table is attribute A, then which of the following normal forms dose this relation satisfy?

I First II Second III Third

(a) I only (b) None (c) I, II and III (d) I and II only

(15) In EER modeling, generalization is the process of generating

(a) superclasses out of subclasses (b) attributes out of entities

(c) subclasses out of superclasses (d) entities out of attributes

Please write your solution of Question 1 in the following table. Otherwise invalid.

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

2. Fill in the Blanks. （2 points*5）

(1) Data that describe the structure of database is called __A___

(2) The DBMS controls ____B_____ by ensuring that one user's work does not inappropriately interfere with another user's work.

(3) Database administrators must make sure that ___C_____ measures are in place and enforced so that only authorized users can take authorized actions at appropriate times.

(4) Database administrators must make sure that ___D____ and ___E____ techniques and procedures are operating to protect the database in case of failure and to recover it as quickly and accurately as possible when necessary.

Please write your solution of Question 1 in the following table. Otherwise invalid.

No	A	B	C	D	E
Answer	metadata	concurrency	security	backup	recover

3. Answer questions.（25 points）

(1). Briefly describe the function of the DBMS in a database system. **(5points)**

Answer：

The DBMS creates the database and the tables and structures within it. The DBMS also reads and updates the database data. It receives requests from application programs to perform data maintenance tasks. These requests are translated into actions that are performed on the database. In addition to maintaining the user data within the database, the DBMS also maintains the database structures. The DBMS also enforces any rules that have been defined to govern the values of the data, such as data type requirements and referential integrity constraints. The DBMS controls concurrency issues, which deal with the unwanted interruption of one user's work by another user's work. As the only point of entry into the database, the DBMS also provides security for the database to restrict users' access to only the data that they have authority to read or modify. Finally, the DBMS is responsible for the creation of backup copies of the database data and for restoring the database in case a recovery is required.

(2). Given R(U,F), U ={SNO,CNO,GRADE,TNAME,TAGE,OFFICE},
F={(SNO,CNO)→GRADE,CNO→TNAME, TNAME→(TAGE,OFFICE)}
Please tell whether it is in BCNF. If not, please decompose it to a set of BCNF. **(5 points)**

R is not in BCNF. ---------- (2pts)

ρ={SC, CT, TO},
where SC={SNO,CNO,GRADE}, ---------- (1pts)
CT={CNO,TNAME}, ---------- (1pts)
TO={TNAME,TAGE,OFFICE}---------- (1pts)

(3) Explain the concept of internal schema, conceptual schema ,external schema , physical data independence, logical data independence in database system, Describe how to guarantee physical data independence and logical data independence **(7 points)**

An external schema is users'view of the database and a more or less abstract representation of some portion of the total database. It describes that part of database that is relevant to a particular user.----------(1 pt)

The conceptual schema is community view of the database and an abstract representation of the database in its entirety. It describes what data is stored in database and relationships among the data. ----------(1 pt)

The internal schema is physical representation of the database on the computer. It describes how the data is physically stored in the database. ----------(1 pt)

Logical Data Independence refers to immunity of external schemas to changes in conceptual schema. ----------(1 pt)
Physical Data Independence refers to immunity of conceptual schema to changes in the internal schema. ----------(1 pt)

The external/conceptual mapping can guarantee Logical Data Independence. -----(1 pt)

The conceptual/internal mapping can guarantee Physical Data Independence. -----(1 pt)

(4) There are 4 levels of **Transaction Isolation in SQL-92**. Please fill in the blanks of the following table using 'no'or 'maybe'.'no'means this **Isolation** level can avoid that problem totally and 'maybe'means this problem maybe occur under that **Isolation** level. **(8 points)**

level	Lost Update	Dirty Read	Unrepeatable Read	Phantom
READ UNCOMMITTED	No	Maybe	Maybe	Maybe
READ COMMITTED	No	No	Maybe	Maybe
REPEATABLE READ	No	No	No	Maybe
SERIALIZABLE	No	No	No	No

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4. SQL (20 points=5 points*4)

Write SQL statements to complete the following tasks based on the below database. There are 6 relation schemas as follows.

Class(classno ,studentnumber)
studentnumber stands for the number of students in the class.
s (sno,sname,sex,birthday,classno,totalCredit),
classno is not null, stands for the class number of a student.
teacher (tno, tname, sex)
course (cno, cname, credit);
teaching (tno, cno, Llanguage)
SC(sno, cno, grade)

(1) Search for the teachers who teach both Data Structure and Database System, showing their names.
Answer:

```
( Select    tname
From teacher t, teaching t1, course c
Where t.tno=t1.tno and t1.cno=c.cno
  And cname='Data Structure'
)
intersect
( Select    tname
   From teacher t, teaching t1, course c
   Where t.tno=t1.tno and t1.cno=c.cno
    And cname='Database System'
 )
```

(2) Find the students who take all the courses and list their names.

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

(3) Create a Trigger named ‘transfer_num’ on Table s, it can decrease by 1 the number of students in the original class and increase by 1 the number of students in the new class when transferring a student from the original class to a new class.
Answer:

```
CREATE TRIGGER transfer_num ON s
FOR    UPDATE
AS    begin
      Update class
      set studentNumber= studentNumber+1
      where classno = (select classno from inserted);
      Update class
      set studentNumber= studentNumber-1
      where classno = (select classno from deleted)
```

```
end;
```

(4) Create a Stored Procedure named 'select_all', it can display sno, sname, the number of electives, average score and total credits of the students who take the courses taken by a given student with parameter: student name.
Answer:

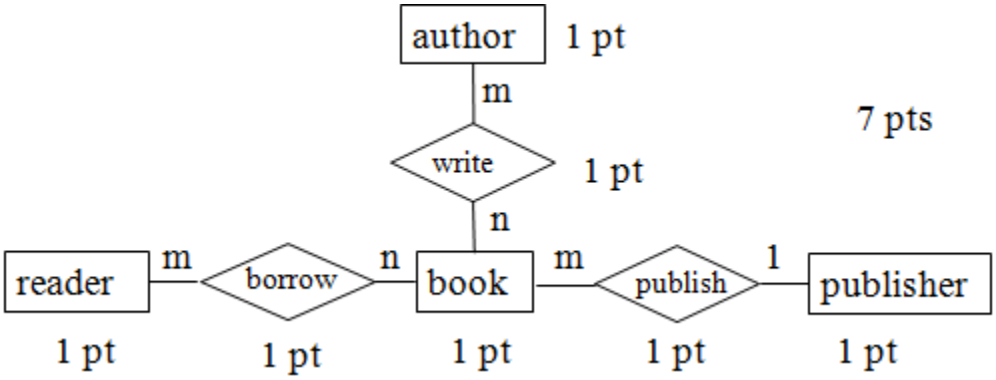
```
Create proc select_all @sname char(10)
AS begin
    create table info(sno char(8),sname char(10));

    insert into info(sno,sname)
    select distinct x.sno, sname
        from sc as x,s
        where   s.sno=x.sno and not exists
         ( select *
            from sc y, s
            where y.sno=s.sno and sname=@sname and not exists
                (select * from   sc z
                  where x.sno=z.sno and z.cno=y.cno));

    select   info.sno, sname, COUNT(c.cno)as num_c, AVG(grade)as
                avg_g, sum(credit)as totalCredit
    from info,sc,course c
    where info.sno=sc.sno and sc.cno=c.cno
    group by info.sno, sname
end
```

5. Database Design (15 points)

Suppose that you are asked to design a database about book publishing and borrowing. There are many publishers and many kinds of books. One book only can be published by one publisher and may be written by several authors. All the authors of one book share the copyright in different proportion, and each author has his or her rank among all the authors of this book. Each book has a fixed price. One book can be read by many readers and one reader can borrow many books from library. Each transaction of borrowing book also includes the time of borrowing book and returning book except book number and reader number. **In addition**, the database should also include the following information.

(1) The individual information of every author, such as author number, name, phone number, address.
(2) The detail information of every publisher, such as its name, address and TelNo.
(3) The information of a book, such as its title, type, publisher, price, author(s).
(4) The information of a reader, such as borrower's card number (i.e. reader number) , name, sex, profession, address, TelNo.

Please draw the ER-diagram for the application, **leaving the attributes out of the diagram**, and write the set of relation schemas. Then point out the primary key of each relation schema and foreign key(s) if any.



7 pts

Book（BNo，Type，price，PName) <FK>=PName (1 pt)

Author (ANo, Aname.TelNo, address) (1 pt)

Reader (RNo，rname，sex, profession, address, TelNo) (1 pt)

Publisher （PName，address, TelNo ） (1 pt)

Borrow（RNo，BNo，borrowtime，duetime)

<FK1>=RNo , <FK2>=BNo (2 pts)

Write (BNo, ANo, copyright, order)

<FK1>=BNo , <FK2>=ANo (2 pts)