Course Title：：Database system　学年学期：　　　　2012—2013 学年第 2 学期

Course code： A0L209Q　School： Software Engineering 出题教师：王方石、冯凤娟

Name： _____　Student Number： _____　Teacher name： _____

学生学院： _____　　班级： _____

No.	I	II	III	IV	V	VI	Total
Score							

I. Single choice（15 points）

1. **An entity** is a distinct object which can be (1) ?
　(a) only an abstract object.　　　　　　　　(b) only a concrete object.
　(c) either an abstract object or a concrete object.　(d) all the above are not correct.

2. If the index structure is changed, what kind of change dose it belong to? (2)
　If an attribute is added to a relation schema, what kind of change dose it belong to? (3)
　If a field is removed from a user's view, what kind of change dose it belong to? (4)
　(a) external schema change　(b) conceptual schema change　(c) internal schema change

3. Find all courses which are not chosen by student wang, list their course numbers.
　Which of the following algebra expression is not correct? (5)
　　　　(a) $\pi_{C\#}(SC)-\pi_{C\#}(\delta_{SN=\text{'WANG'}\wedge S.S\#=SC.S\#}(S\times SC))$
　　　　(b) $\pi_{C\#}(C)-\pi_{C\#}(\delta_{SN=\text{'WANG'}\wedge S.S\#=SC.S\#}(S\times SC))$
　　　　(c) $\pi_{C\#}(C)-\pi_{C\#}(\delta_{SN=\text{'WANG'}}(S) \bowtie SC)$
　　　　(d) $\pi_{C\#}(C)-\pi_{C\#}(\delta_{S.S\#=SC.S\#}(\delta_{SN=\text{'WANG'}}(S)\times SC))$

4. Which expression is not correct? (6)
　(a) R∩S =R-(R-S)　　　　　(b) R∩S =S-(S-R)
　(c) R∩S =R-(S - R)　　　　　(d) R∩S= S∩R

5. (7) is the process of constructing a model of the information used in an
　enterprise based on a specific data model (e.g. relational), but independent of a
　particular DBMS and other physical considerations.
　　(a) Conceptual Database Design　　　(b) Logical Database Design
　　(c) Physical Database Design　　　　(d) Database implementation

6. A relation in 2NF is updated to that in 3NF, it needs to __(8)__

    (a) Eliminate the non-primary-key attribute's partially functional dependency on candidate keys.

    (b) Eliminate the non-primary-key attribute's partially and transitively functional dependency on candidate keys.

    (c) Eliminate the primary-key attribute's partially functional dependency on candidate keys.

    (d) Eliminate the primary-key attribute's partially functional and transitively dependency on candidate keys.

7. If a schedule follows 2PL protocol，it __(9)__ be a *serializable* schedule; Even though the schedule does not follow 2PL protocol，it may be still a *serializable* schedule.

      (a) must   (b) may   (c) must not   (d) can not

8. The physical storage structure will be __(10)__ to the application programmer in a database approach, and will be __(10)__ to the application programmer in a file system approach.

   (a) hidden, visible   (b) visible, hidden   (c) visible, visible   (d) hidden, hidden

9. For two tables to be union compatible, the tables should be the same with respect to which of the following? __(11)__

    (a) cardinality   (b) degree   (c) name   (d) keys

10. Who can always give access permissions to a table? __(12)__

    (a) the owner of the table   (b) the user of the table

    (c) only the super-user   (d) only the database administrator (DBA)

11. In EER modeling, generalization is the process of generating __(13)__

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

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

12. When mapping from an ER model to a relational model, a strong entity is mapped into a __(14)__

    (a) row   (b) column   (c) key   (d) table

13. All changes made by a committed transaction can be recovered __(15)__

    (a) only if there have been no software failures

    (b) irrespective of whether there have been hardware or software failures

(c) only if there have been no hardware failures

(d) only if there have been no software AND no hardware failures

Please write your answer in this table, otherwise invalid.

No.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Answer								
No.	(9)	(10)	(11)	(12)	(13)	(14)	(15)	
Answer								

II. Fill in blanks   (20 points,   2points/blank)

1. An insertion operation will __(1)__ if the insertion violates the uniqueness property of a key.
2. Indexing a database table is likely to __(2)__ performance of select operation on the table.
3. The term __(3)__ refers to the ability to change the physical layout of the data without changing the external schemas, the conceptual schemas, or the application programs.
4.   Database design typically consists of Conceptual design, __(4)__ and __(5)__
5.   Inconsistent Analysis Problem is also called __(6)__ or phantom read
6.   A __(7)__ lock on a data item represents permission to perform only read on the data item.
7.   In a network database, data records are represented using __(8)__ data structures.
8.   Atomicity, Consistency, __(9)__, Durability are the properties of a transaction.
10. The purpose for checkpoint when recovering the database is to __(10)__ the amount of searching and subsequent processing that we need to carry out on the log file.

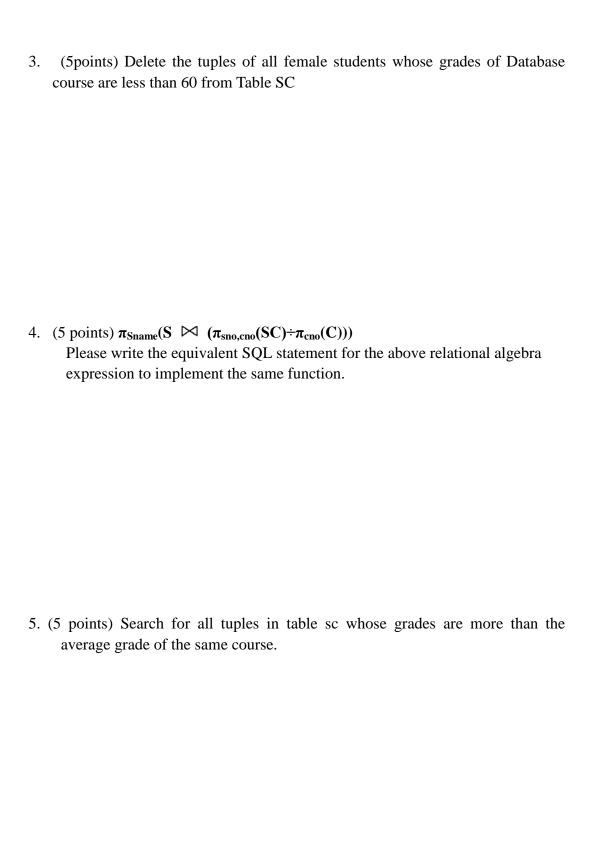**Please write your answer in this table, otherwise invalid.**

No.	(1)	(2)	(3)	(4)	(5)
answer					
No.	(6)	(7)	(8)	(9)	(10)
answer					

III. **(25 points)** There are three relation schemas in Database STUDENT, which are as follows.

 S (sno, sname, age, sex, Total_credits) <PK>=sno,

  where Total_credits is the sum of the credits of all courses which the student has chosen.

 C (cno, cname, credit, teacherNo) <PK>=cno

 SC (sno,cno,grade)   <PK>=(sno, cno) , <FK>=sno, <FK>=cno

1. (7 points) Design a trigger or two triggers that can update the corresponding value of Total_credits in table S after inserting or deleting a certain course in table SC .

2. (3 points) Modify table S add a constraint to restrict that male's age must be less than 23 or female's age must be less than 21.

3. (5points) Delete the tuples of all female students whose grades of Database course are less than 60 from Table SC

4. (5 points) $\pi_{Sname}(S \bowtie (\pi_{sno,cno}(SC) \div \pi_{cno}(C)))$

   Please write the equivalent SQL statement for the above relational algebra expression to implement the same function.

5. (5 points) Search for all tuples in table sc whose grades are more than the average grade of the same course.

IV. （12 points）Please give out the set of functional dependency for each relation schema, specify all candidate keys of each relation and the highest normal formal to which the following relation belongs to. Please write your reasons.

1. R1 (S,P,J), where S is the student number, J is course number and P is the grade rank in one course. Given one student and one course, there is unique rank to correspond to him or her. Given one course and one rank, , there is unique student to correspond to this position.

   Solution:

2. R2 (S,T,J), where S is the student number, J is course number and T is the teacher number. Given one student and one course, there is unique teacher to correspond to him or her. Each teacher teach only one course.

   Solution:

V. (13points) Please answer the following questions briefly.

1. Please tell the difference between Equi-join and Natural join.

2. Potential to violate BCNF in 3NF may occur in a relation that:

3. **Two concurrent transactions are scheduled as follows. Please tell whether it is a serializable schedule and give the reason.**

Time	T_1 :H=F+1	F, G, H	T_2, :F=G+1
1		0,0,0	
2	LOCK S(F)		
3	READ(F)		
4	A:=F		
5	UNLOCK(F)		
6			LOCK S(G)
7			READ(G)
8			B:=G
9			LOCK X(F)
10			F:=B+1
11			WRITE(F)
12		1,0,0	COMMIT
13	LOCK X(H)		
14	H:=A+1		
15	WRITE(H)		
16	COMMIT	1,0,1	

VI. (15 points) **Database Design**

Suppose an organization needs to manage the following information: order number, client number, client name, client address, product number, product name, product price, ordered product quantity(Quantity), order date. One client can have many order sheets and there can be many products ordered in one order sheet.

(1)Please draw E-R model

(2)Transform the above E-R model to the set of relation schemas and specify the primary key and foreign keys (if any) in each relation.