2018 级数据库期中试卷

课程名称：数据库系统及其应用(Database Systems and Applications)

学生姓名：_____ 学　　号：_____

专　　业：_____ 年级/班级：_____

课程性质：专业必修

I	II	III	IV	V	VI	总分	阅卷人签名

请在自己的答题纸上抄写以下内容并签名之后开始答题。

本次考试是本人独立完成，保证没有在考试时间范围内就相关内容与任何人进行交流。

本人签字：

Part I. (30 Points ,2 points for each problem)

1. Database system can solve the data redundancy and inconsistency problems with file-processing systems. (　　)
   (A) True　　(B) False
2. A foreign key is a referential constraint between two tables. (　　)
   (A) True　　(B) False
3. When a client requests a record that contains a BLOB (binary large object), the database server that receives the request should return the entire record at a time. (　　)
   (A) True　　(B) False
4. SQL allows you to not only create a new table, but also to delete an existing table from the database. (　　)
   (A) True　　(B) False
5. The relation R(A,B,C,D) consists of ONLY the tuples that are listed and NO other tuples. The functional dependency $C \rightarrow B$ is not satisfied. (　　)

A	B	C	D
3	2	1	3
1	2	1	5
2	3	6	8
2	3	2	1

   (A) True　　(B) False
6. Given the two tables: *Staff(id, name, deptno, job, salary)* and *Org(deptno, deptname, location)*.The statement "*Update Staff set salary=salary*1.1 where deptno in (select deptno from org where location='Shanghai')*" will give all staffs in Shanghai a 10 percent salary raise. (　　)
   (A) True　　(B) False
7. Which statement is true? **(　　)**
   (A) Physical level of data abstraction describes what data are stored in the

database
(B) Logical level of data abstraction describes what data are stored in the database

8. True or false? ( )
Primary key can be null, foreign keys can not be null.
(A) True (B) false

9. Given the following database tables. Primary keys are underlined
person(SSN, name, address)
car(license, year, model)
accident(license, accident_date, driver, damage_amount)
owns(SSN, license)
We want to find the SSN of every person who owns one or more cars, none of which has ever been involved in a car accident. Which expression is true? **( )**

(A) $\pi_{SSN}(Owns) - \pi_{SSN}(Owns \triangleright\triangleleft Accident)$

(B) $\pi_{SSN}(Owns \triangleright\triangleleft Accident) \div \pi_{SSN}(Owns)$

10. What does the following SQL statement do? *"select name from person where address = 'Beijing'"* ; ? **( )**
(A) find the name of all people who live in Beijing and have cars.
(B) find all people who live in Beijing from the person table.
(C) find the name of all people who live in Beijing.
(D) None of the above

11. Which is the benefit of denormalization? **( )**
(A) performance improvement
(B) higher security
(C) less storage
(D) none of the above

12. Which is true? **( )**
(A)Entity sets are weak when their key attributes come from other classes to which they are related.
(B) It is impossible for tuples to have a null value.

13. Which of the following is false? **( )**
(A) A relation can have only one candidate keys.
(B) A candidate key can uniquely identify a row.

14. Suppose we have a relation declared by: **( )**

```
CREATE TABLE R (name VARCHAR(50) PRIMARY KEY,
                salary INT CHECK(salary <= 40000) );
```

Initially, the relation has three records:

Name	Salary
Tom	10000
Joe	20000
Sue	30000

We execute the following sequence of modifications. Some of them may be rejected due to the constraints in the relation.

(1) INSERT INTO R VALUES ('Fred', 12000);
(2) UPDATE R SET salary = 50000 WHERE name = 'Sue';
(3) INSERT INTO R VALUES ('Tom', 13000);
(4) DELETE FROM R WHERE name = 'Joe';

At the end of these statements, the sum of the salaries over all the tuples in R is

(A) 52,000 (B) 62,000 (C) 65,000 (D) 72,000

15. Which statement about the key is correct? ( )

(a) A primary key must also be a super key.
(b) A candidate key must also be a super key.
(c) A primary key must also be a super key.
(d) All of statements are correct.

Part II. Relational Model (10*4=40 Points)

A toy factory uses a small database with three relations to manage the toys and parts, as described in Table 1.

Table 1: Schemas of three relations

Relation	Attribute 1	Attribute 2	Attribute 3
toy	tid: char(10)	tname: varchar(30)	price: int
part	pid: char(10)	pname: varchar(50)	price: int
toypart	tid: char(10)	pid: char(10)	amount: int

Question 1: Please write down relational algebra for following queries.

1. List all toys whose *prices* are between 100 and 200.
2. List all parts whose *prices* are greater than 10.
3. List all toys using the part *engine*.
4. The price of the toy "hello-kitty" is modified to 40. How to implement?
5. List the name of all parts used by the toy "hello-kitty".

Question 2: Please write down SQL statements for following queries.

1. List the price of "hello-kitty".
2. Create a view, named alltoys, to list the id and name of all toys.
3. List all toys related to "tigger".
4. Insert a new toy, with the name as "jump-tigger", the id as "t006" and the price 150.
5. List the number of parts in each toy, in format of (tid, num)

Part III. Entity-Relationship Model (15 Points)

Model the entities and relationships (including attributes and properties of relationships) described below in an ER-diagram. Write down any assumptions

you make. Convert the ER-diagram to relational schema and indicate the primary key and foreign keys of each relation.

1. Your task is to design a database for an online video service that offers hit TV series（连续剧）. The following is the description of the application:
Each series has a name and a description.

- We would like to record information on the regular cast（演员）of the series. In other words, for each main actor/actress in the series, we want to record his/her name and address. You may assume that the cast doesn't change.
- Each series has many episodes（集）. Each episode has an episode number, the year and date it was first aired, and the length of the episode in minutes. The episode number uniquely identifies an episode with respect to the series, but two different series can have the same episode number.
- Registered viewers can comment on any episodes. For each comment, we want to record its post date and content.
- For each registered viewer, we want to record his/her userID and password.

Part VI. Relational Database design (15 Points, 5 points for each problem)

1. Consider a relational schema U(A, B, C, D), and functional dependencies {A->B, C->D}. List the candidate keys for U.
2. Consider a relational schema U(A, B, C, D, E, I), and functional dependencies F={A->D, AB->E, BI->E, CD->I, E->C}. Computer (AE)+, the closure of AE.
3. Let R (C, T, D, I, E, S, Y, B, R, P, O) be a relation scheme with a set F of functional dependencies.

   F={ C → T, D, I

   B, R →P

   C, E, S, Y →B, R, O}

   A candidate key= {C, E, S, Y}.

   Is R in BCNF ? Why or Why not ? If R is not in BCNF, please decompose it into a set of relations $\{R_1, R_2, ..., R_n\}$ such that each relation is in BCNF.