四川大学期末考试试题（闭卷）

（2011—2012 学年第 1 学期）

课程号：**31113740** 课序号：_____ 课程名称：**数据库系统原理 （闭卷）** 任课教师：**龚勋、张天庆**

适用专业：**软件工程** 适用年级：**2009** 学生人数：_____ 印题份数：_____ 学号：_____ 姓名：_____

考 试 须 知

四川大学学生参加由学校组织或由学校承办的各级各类考试，必须严格执行《四川大学考试工作管理办法》和《四川大学考场规则》。有考试违纪作弊行为的，一律按照《四川大学学生考试违纪作弊处罚条例》进行处理。

四川大学各级各类考试的监考人员，必须严格执行《四川大学考试工作管理办法》、《四川大学考场规则》和《四川大学监考人员职责》。有违反学校有关规定的，严格按照《四川大学教学事故认定及处理办法》进行处理。

题号	一	二	三	四	五	六	七	八	九	十	考勤	实验	期中	期末	总分
得分															

考试时间	年 月 日	阅卷教师签名	

I. Multiple Choices. (2poits×5)

1. Which of the following statements is true? _____C

I. 3NF implies 2NF

II. BCNF implies 3NF

III. 3NF implies BCNF

A. None B. I only C. I and II D. I and III

2. The term *physical data independence* refers to the ability to change _____.B

A. the conceptual schema without changing the application programs
B. the physical layout of the data without changing the external schemas, the conceptual schemas, or the application programs
C. the application programs without changing the conceptual schema
D. the data without physically relocating the tables

3. In an ER model, what is the degree of a relationship type? _____A

A. The number of entity types participating in the relationship type
B. The strength of the relationship type
C. The number of instances of the relationship type
D. The validity of the relationship type

4. Which of following is not true? D

A. $R \cap S = R-(R-S)$ B. $R \cap S = S-(S-R)$ C. $R \cap S = (R-(R-S)) \cup (S-(S-R))$ D. $R \cap S = (R-(R-S))-(S-(S-R))$

5. What is the order of execution of *select*, *from* and *where* in a select statement? C

A. select-from-where B. where-select-from C. from-where--select D. where-from-select

II. Relational Algebra and SQL (5points×8)

Consider the following relational schema describing a book rental database:

Title (isbn, name, author, publisher)
Book(book_id, isbn)
Customer(customer_id, name, address, age)
Rental (customer_id, book_id, start_date, end_date, rent)

1. Give an expression in the relational algebra for each of the following queries:

1) Find names and addresses of all customers who have **never** rented "The Old Man and the Sea".

$$\prod_{custome-id,name}(Customer) -$$

$$\prod_{custome-id,name}(\sigma_{title='The\ old..'}(((Title \infty Book) \infty Rental) \infty Customer))$$

2) Find ids of all customers who have rented all books written by "Hemingway".

$$\prod_{custome-id,book-id}(Customer) \div \prod_{book-id}(\sigma_{author='Hemingway'}((Title \infty Book)))$$

2. Write SQL statements in SQL2 to perform the following commands.

3) Find names and addresses of all customers who have rented "The Old Man and the Sea".

```
Select C.name, address form Customer C, Book B, Title T, Retal R
where C.customer_id = R.customer_id and B.book_id = R.book_id and B.isbn=T.isbn and t.name =' The Old Man and the Sea';
```

4) Find names and addresses of all customers who have **never** rented "The Old Man and the Sea".

```
Select C.name, address form Customer C
Select C.name, C.address
From Customer C
Where not exists (
Select * from Book B, Title T, Retal R
where C.customer_id = R.customer_id and B.book_id = R.book_id and B.isbn=T.isbn and t.name =' The Old Man and the Sea');
```

5) Find names of all customers who have rented "Iliad" and "Odyssey", both.

```
Select C.name form Customer C, Book B, Title T, Retal R
where C.customer_id = R.customer_id and B.book_id = R.book_id and B.isbn=T.isbn and t.name =' Iliad'
Intersect
Select C.name form Customer C, Book B, Title T, Retal R
where C.customer_id = R.customer_id and B.book_id = R.book_id and B.isbn=T.isbn and t.name =' Odyssey'
```

6) Find names of all customers who have rented all books written by "Hemingway".

```
Select name from customer C where not exists
((select isbn from Title where author = 'Hemingway')
```

Except
(select T.isbn from Title T, Book B, Rental R
where C.customer_id = R.customer_id and B.book_id = R.book_id and B.isbn=T.isbn))

7) Find the name of the customer who has rented more books than any other.

Select name from Customer C, Rental R where C.customer_id = R.customer_id
group by C.customer_id, name having coun(*)>=all
(select coun(*) from Rental group by cunstomer_id);

8) Assume the relation *Title* and *Book* has been created using the following statements:

```
create table Title
(     isbn char(16) primary key,
      book_name char(40),
      author char (20),
      publisher char(30)
);
create table Book
(     book_id char(5) primary key,
      isbn char(16)
);
```

Write an ALTER statement to specify the referential integrity constraint on *Book*.

ALTER TABLE BOOK ADD CONSTRAINT BOOK TITLE

FOREIGN KEY(isbn) REFERENCES TITLE

III. The following table stores total hours about which each employee works for projects in a software company. Note that an employee can take part in different project and work on different standard task of that project. (5points×4)

Employee_Project_Hour:

employeeId	employeeName	projectId	projectDescribe	taskId	taskDescribe	totalHours
3	Avi	5001	E-Gocernment	D	designing	255
3	Avi	5001	E-Gocernment	P	planning	255
3	Avi	3002	Bank Affair	D	desiging	155
3	Avi	3002	Bank Affair	P	planning	155
5	Susan	5001	E-Gocernment	T	testing	315
5	Susan	4002	Information Security	T	testing	115
5	Susan	4003	Risk Management	C	coding	165

Perform the following tasks:

1．List all the FDs.

Fd1: employeeId→employeeName

Fd2：projectId →projectDescribe

Fd3：taskId→ taskDescribe

Fd4：employeeId,projectId→totalHours, employeeName, projectDescribe（total hours 表示一个员工在一个项目中所做的总时间）

Fd5: employeeId, projectId, taskId→all

2．List candidate key(s) of the relation..

(employeeId,projectId,taskId)

(注意：候选码一定要打上括号，不然会被理解成这三个是三个候选码）

3．What normal form is the relation in? Explain.

第一范式，fd1,fd2,fd3,fd4 存在部分依赖

4．Apply normalization to it and carry it up to 3NF or higher.

消除部分依赖，得到第二范式

2NF：

Employee(employeeId, employeeName)

Project(projectId, projectDescribe)

Task(taskId, taskDescribe)

TotalHours(employeeId,projectId,totalhours)

Participate(employeeId,projectId,taskId)

无传递依赖，故也是 3NF

IV． In this problem, we shall design a user database for elective-system （选课系统） involving students, instructors and courses. (15 points×2)

The relevant information:

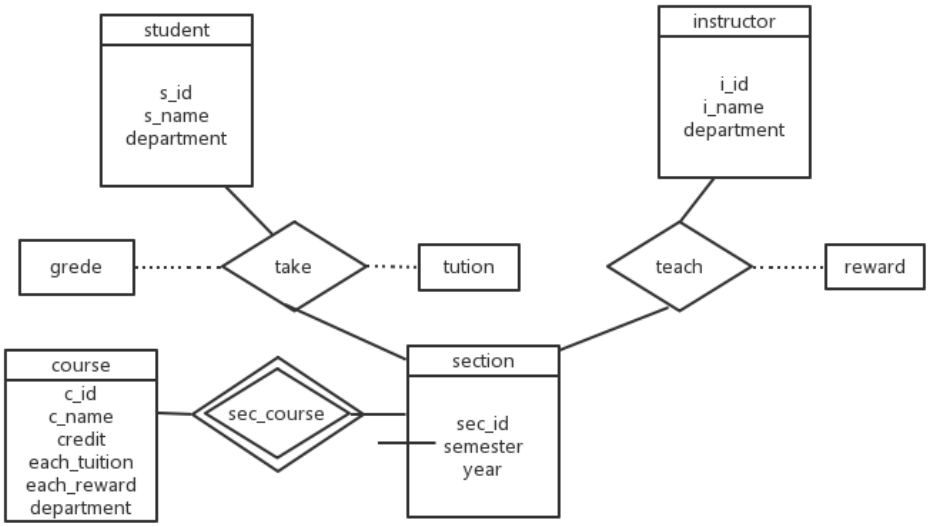
- Information about a students includes the ID of the student and his/her name. The ID of the student is unique within university, but two students may have the same name. Additional, we want to know which department the student is at.
- Information about an instructor includes the ID of the instructor and his/her name. The ID of the instructor is unique within university, but two students may have the same name. Additional, we want to know which department the instructor is at.

- Information about a course includes the ID of the course and its name. The ID of the course is unique within university, but two courses may have the same name. Information about a course also includes the credits of the course, the tuition of each credit, and the reward of each credit. Additional, we want to know which department sets up the course.
- The student can not get his/her degree untill he/she have finished the specified credits.From the elective-system, we want to know the number of credits that each student elect in each semester and total tuition of each semester.
- The instructor must finish the specified credits for each semester.From the elective-system, we want to know the number of credits that each instructor teach in each semester and total reward of each semester.
- Note that a student can elect and an instructor can teach the course that not his/her department set up.

Perform the following tasks:

1) Draw an ER diagram for the database. Do not forget your reasonable assumptions.
2) Convert the E-R diagram into a relational schema using the mapping algorithm

（关于这道题的设计，我问了我们的助教老师，他也不是很清楚，我画的这个是我和助教老师讨论的结果(主要是参考了教材书大学数据库的设计）。这道题的设计应该也有多种。有更好的设计的话，或者谁有参考答案发到班群和大家共享一下吧!)



（这里我没有给实体的主码划线,（因为我不知道那个画图工具怎么划线嘿嘿），大家考试的时候一定记得划线哦!!!）

student（s_id,s_name,department)

Instructot（i_id,i_name,department)

Course(c_id,c_name,credit,each_tuition,each_reward,department)

Section（sec_id,semester,year)

课程名称：　　任课教师：　　学号：　　姓名：

Takes(s_id,c_id,sec_id,semester,year,grade,tution)

Teach(i_id,c_id,sec_id,semester,year,reward)

(总觉得这个设计有些问题。嗯，但是我们不清楚啦~）