

# 四川大学期末考试试题（闭卷）

(2022~2023 学年第 2 学期)

A 卷

课程号-课序号: 311235040 / 01-04 课程名称: 数据库系统和信息管理 任课教师: \_\_\_\_\_

适用专业年级: 软件工程 2021 级 学生人数: 275 印题份数: 280 学号: \_\_\_\_\_ 姓名: \_\_\_\_\_

## 考生承诺

我已认真阅读并知晓《四川大学考场规则》和《四川大学本科学生考试违纪作弊处分规定（修订）》，郑重承诺：

1. 已按要求将考试禁止携带的文具用品或与考试有关的物品放置在指定地点；

2. 不带手机进入考场；

3. 考试期间遵守以上两项规定，若有违规行为，同意按照有关条款接受处理。

考生签名:

题号	一 (10%)	二 (40%)	三 (20%)	四 (10%)	五 (20%)
得 分					
卷面总分			阅卷时间		

注意事项: 1. 请务必将本人所在学院、姓名、学号、任课教师姓名等信息准确填写在试题纸和答卷纸上；  
2. 请将答案全部填写在答卷纸上，本试题纸上的答案一律不计分；  
3. 考试结束，请将试题纸、答卷纸、添卷纸和草稿纸一并交给监考老师。

评阅教师	本题得分

## I. Single Selection (2 points \* 5 = 10 points)

- In the SQL, which clause provides a way to define temporary relations? ( )  
A. “unique” clause    B. “with” clause    C. “exists” clause    D. “in” clause
- How many primary keys can a relation have at most? ( )  
A. 0    B. 1    C. 2    D. 5
- In a relational database, which one of the following database objects can improve the execution efficiency of the query ( ).  
A. relations    B. views    C. indexes    D. trigger
- During the database design process, which of the following is the conceptual model that needs to be created first ( ).  
A. E-R model    B. logical model    C. physical model    D. none of the above
- Which transaction property refers to that once a transaction is successfully committed, the changes made to the database will be saved and will not be lost even if the system crashes or loses power? ( )  
A. atomicity    B. durability    C. isolation    D. consistency

注：试题字迹务必清晰，书写工整。

第1页，共4页  
试卷编号：311-41



扫描全能王 创建

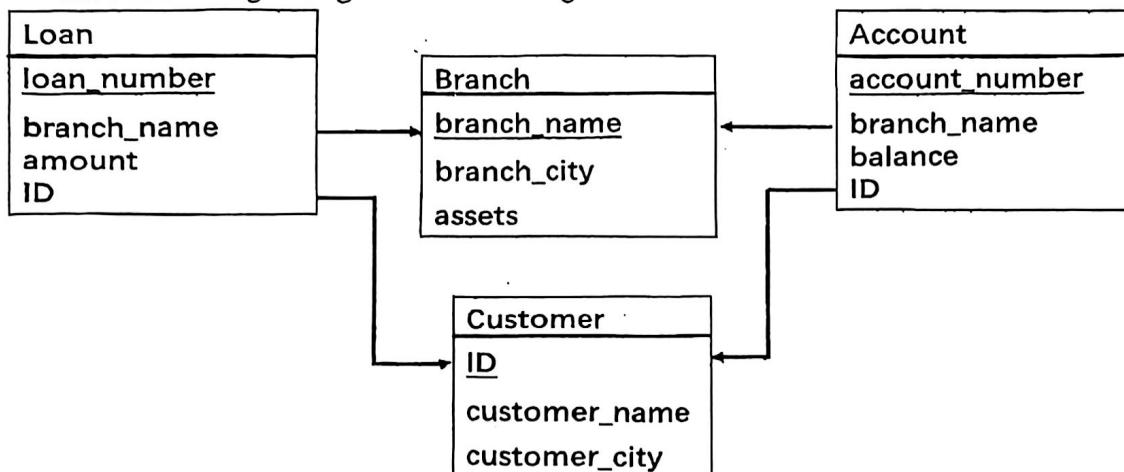
评阅教师	本题得分

## II. Query Expression (4 points×10=40 points)

Consider the bank database. Assume that branch\_name uniquely identify branches and ID uniquely identify customers. A loan or an account can be associated only one customer, but a customer can be associated with more than one loan or account.

branch(branch_name, branch city, assets)	//branch.银行分行表
customer (ID, customer name, customer street, customer city)	// customer.客户表
account (account_number, branch_name, balance, ID)	// account 存款表
loan (loan_number, branch_name, amount, ID)	//loan 贷款表

The schemas diagram is given in the following:



Please use relational algebra language to express query requirements (1)-(4):

- (1) Find all the bank depositing account\_numbers of the customer whose name is '张三'.
- (2) Find the customer IDs and names who has not borrow any loan from bank.
- (3) List ID and the summary of all account balances of every customer.
- (4) List IDs of the customers who have borrowed loans from all branches.

Please use SQL language to express query requirements (5)-(10):

- (5) Query the account\_numbers of customers whose names include “君”;
- (6) Query the IDs of the customers who have at least one loan but no any account.
- (7) List each bank branch\_names and the quantity of customers who have loans from the branch, and output the tuples in descending order of the quantity;
- (8) Query IDs of the customers whose balance summary of his/her depositing accounts is greater than 10000;
- (9) Query IDs of the customers whose balance summary of his/her depositing accounts is the largest;
- (10) Find the customer IDs who have borrowed loans from all the bank branches which the customer (ID="A101") has borrowed loans from;



课程名称：数据库系统和信息管理 任课教师：陈鹏 吴成恩 刘一静 陈蓉 伍元凯 学号： 姓名：

评阅教师	本题得分

**III. Normalization (10 points\*2 =20 points)**

- Consider relation schema  $R=\{A,B,C,D,E\}$ ,  $F=\{A \rightarrow B, B \rightarrow C, B \rightarrow E, C \rightarrow D, BD \rightarrow E\}$ 
  - Find the candidate keys of R. If you think R has no candidate keys, write "no". (3 points)
  - Is R in BCNF? Please give the reason for your judgment. (3 points)
  - Is F a canonical cover? if no, please find a canonical cover for F. (4 points)
- Consider relation schema: Student Project (sno, sname, deptname, pno, pname, pfund, reward)  
The constraints about relation Student Project are:
  - each student has a unique number (sno) to identify oneself.
  - each student has only one name (sname), and only be in one department (deptname).
  - Each project has a unique number (pno) to identify itself.
  - Each project has only one project name (pname) and a corresponding fund (pfund).
  - One student can participate in multiple projects, each project can be participated by multiple students.
  - Each student will get a reward for participating a project.
  - According to the above constraints, please write out the reasonable functional dependencies holding on relation Student Project (3 points)
  - List all the candidate keys of Student Project (2 points)
  - Is Student Project in 3NF? If it is not in 3NF, please decompose it into a set of 3NF relations and explain why your decomposition is lossless and dependency preserving. (5 points)

评阅教师	本题得分

**IV. Concurrently Control and Recovery (10 points\*1=10 points)**

There are two transactions T1, T2 which execute concurrently, consider the following schedule S1:

T1	T2
write(A)	
	read(B)
read(B)	
Commit	
	read(A)
	commit

- Is S1 a conflict serializable schedule? Please give the reason for your judgment. If so, S1 conflict equivalent to which serial schedule? (3 points)
- Determine whether schedule S1 is a recoverable schedule, is a cascadeless schedule, and give the reasons. (2 points)
- Please add lock and unlock instructions to T1 and T2 to meet the two-phase locking protocol (2PL). (3 points)
- Whether T1 and T2 may produce deadlock after adding the two-phase locking protocol(2PL)? Please give the reason for your judgement. (2 points)

注：试题字迹务必清晰，书写工整。

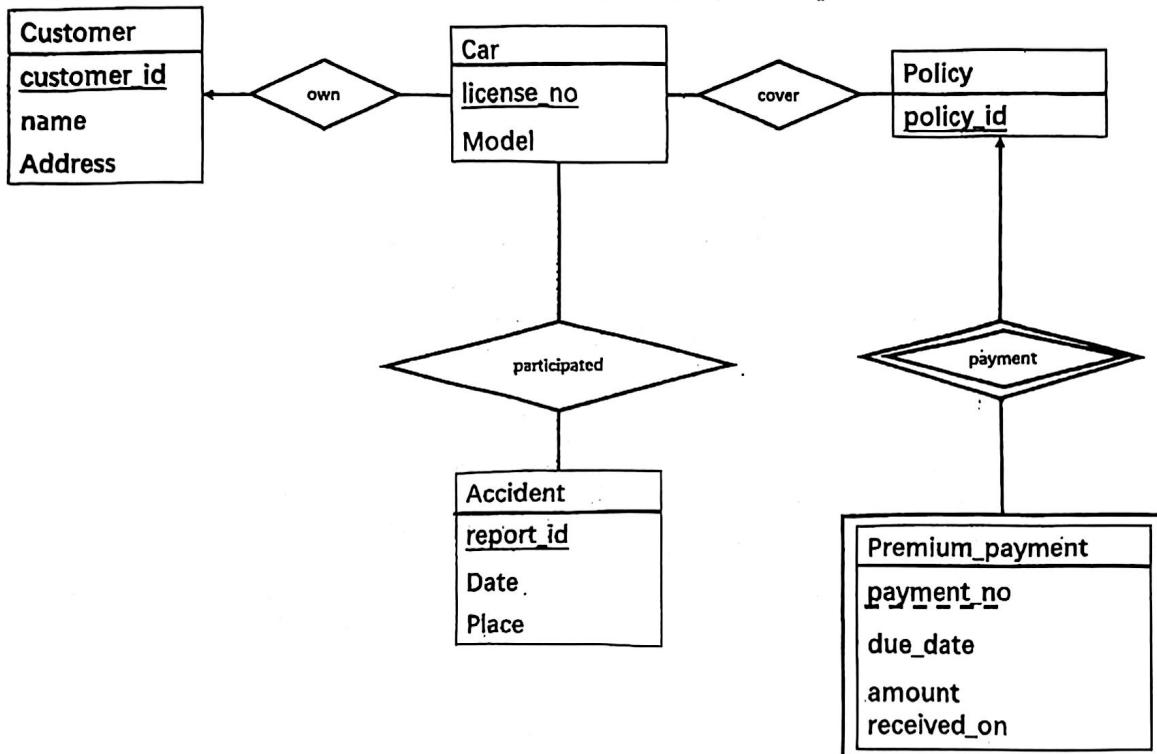


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## V. Database Design (10 points\*2=20 points)

1. There is an E-R diagram for a car insurance company.

Please convert it into relations, and underline the primary keys and explain all foreign keys of them.



2. Design a database for a worldwide packet delivery company (e.g., FedEx or DHL).

Customer has attributes: customer\_id, name, address, telephone.

Packet has attributes: packet\_id, weight, expense.

Location has attributes: place\_id, place\_name, city, country.

The database must be able to keep track of customers who send packet or receive packet; some customers may do both. A packet can be sent by one customer and be received by another customer, and database should record the time sent and the time received.

Each packet must be identifiable and trackable, so the database must be able to store the history of locations a packet passed through.

Please draw the ER diagram and underline the primary key of each entity set.

