

四川大学期末考试试题（闭卷）

（2018~2019 学年第 2 学期）

A 卷

课程号: 311142040 课程名称: 数据库系统 任课教师: _____

适用专业年级: 软件工程 2017 级 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添卷纸上；
2. 请将答案全部填写在本试题纸上；
3. 考试结束，请将试题纸、添卷纸和草稿纸一并交给监考老师。
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评阅教师	得分

I . Simple choice. (1 point each; 10 total)

1. The cardinality of a table is the number of () in the table.
(A) columns
(B) keys
(C) rows
(D) foreign keys
2. An insertion operation will () if the inserted primary key has a NULL value.
(A) crash the system
(B) fail
(C) succeed without warning
(D) succeed with warning
3. Which of the following SQL commands can be used to change, add, or drop column definitions from a table? ()
(A) ALTER TABLE
(B) MODIFY TABLE

- (C) CHANGE TABLE
(D) UPDATE TABLE
4. Which of the following commands can be used to remove access privileges associated with a table? ()
(A) DELETE
(B) REMOVE
(C) REVOKE
(D) DROP
5. Which SQL statement can delete the definition of the view "*faculty*"? ()
(A) drop view faculty
(B) drop faculty view
(C) remove view faculty
(D) delete view faculty
6. When mapping from an ER model to a relational model, a strong entity is mapped into a ()
(A) column
(B) table
(C) key
(D) row
7. What attributes does a subclass have? ()
(A) Just the attributes from the superclass
(B) A subset of the attributes of its superclass
(C) None of the attributes of its superclass
(D) All the attributes of its superclass, and possibly more
8. Let $R(A, B, C, D)$ be a relation schema, and $A \rightarrow B, C \rightarrow D$, then () is wrong.
(A) $AC \rightarrow B$
(B) $AC \rightarrow D$
(C) $AD \rightarrow B$
(D) $AD \rightarrow BC$
9. In a database system, which part is it to provide data consistency? ()
(A) the DBA
(B) then user
(C) the DBMS
(D) the application program

10. in 2PL protocol, at()stage, A transaction may not obtain locks, but can release locks.

- (A) Growing phase
- (B) Shrinking phase
- (C) Committed
- (D) Aborted

评阅教师	得分

II. Queries. (5 points each; 40 total)

Consider the relational database of a banking enterprise with the following relation schemas, where the primary keys are underlined.

branch (branch_name, branch_city, assets)

customer (customer_name, customer_street, customer_city)

loan (loan_number, branch_name, amount)

borrower (customer_name, loan_number)

account (account_number, branch_name, balance)

depositor (customer_name, account_number)

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

- (1) Find all loan number for loans made at the 'Perry ridge' branch (that is the name of a certain branch) with loan amounts greater than \$1000.
- (2) Find names of all customers who have accounts in **all** branches located in 'Brooklyn'.
- (3) Find the max account balance in branch located in 'Brooklyn'.

2. Write SQL statements to perform the following commands:

- (1) Find the name of all customers who have accounts but not loans.
- (2) Find the name of all customers who have accounts in all branches located in 'Brooklyn'.
- (3) Find the name of all branches that have assets greater than those of at least one branch located in 'Brooklyn'.
- (4) Find the names of all branches where the average account balance is more than \$2000.
- (5) Find all customers that live in the same city with branches they open accounts.

评阅教师	得分

III. Normalization (20 points total)

1. Consider the following relational schema:

student_graduation_project = (sID, name, iID, iName, iTitle, year, project Name, grade)

It contains information about graduation designs of students. The Attribute iID is the ID of Instructor, The Attribute iName is the name of Instructor, The Attribute iTitle is the title of Instructor, we have the following information on the attributes:

- Each student has only one instructor as graduation design advisor.
- Each student has only one graduation design project.
- Each instructor can advisor many students in graduation design.
- Students can take part in same projects.

The following is an instance of the schema:

sID	Name	iID	iName	iTitle	project Name	grade
11	Cheng	101	Yuan	Professor	Face Image Recognition	B
12	Zhang	101	Yuan	Professor	Machine Learning	A
13	Liu	102	Cheng	Instructor	Face Image Recognition	A
14	Yang	102	Cheng	Instructor	Machine Learning	C
15	Li	103	Zhou	Professor	Speech Recognition	D

(1) Based on above, indicate for each of the following potential functional dependencies, whether it is indeed an FD or not. (3 points)

- (A) sID → Name
- (B) sID → iID
- (C) iID → grade
- (D) iName → iID
- (E) ID → (project Name, grade)
- (F) Project Name → grade

(2) Based on above, indicate for each of following sets of attributes whether it is a candidate key for student_graduation_project or not. (3 points)

- (A) {sID}
- (B) {sID, iID}
- (C) {sID, project Name}
- (D) {name}
- (E) {name, iName}
- (F) {iID, project Name}

(3) Is the relation schema student_graduation_project in BCNF? Why? Is it in 3NF?

Why? If it is not in 3NF, bring it to a set of relations at least in 3NF; specify primary keys and referential integrity constraints for each relation. **(4 points)**

2. Consider a relation R (A, B, C, D, E) with the set of Functional Dependencies

$F = \{A \rightarrow BD, BC \rightarrow E, B \rightarrow D, D \rightarrow A\}$

- (1) Give all candidate keys of R. (3 points)
- (2) Give a canonical cover of F. (3 points)
- (3) Is R in 3NF? explain why if it is or decompose it into 3NF if not. (4 points)

评阅教师	得分

IV. Concurrent Control (10 points total)

Consider two transactions T1 and T2.

T1: read(B) ; A=B+1; write(A)

T2: read(A) ; B=A+1; write(B)

Consider the concurrent schedule of transactions T1 and T2:

T1	T2
read (B)	
A=B+1	
	read (A)
write(A)	
	B=A+1
	write (B)
commit	
	commit

1. Give the result of above schedule. (initial value A=2, B=2). **(3points)**
2. Is the schedule correct or not? Why? **(3points)**
3. Add lock and unlock instructions satisfying 2PL to Transactions T1 and T2, to implement a serializable schedule. **(4points)**

评阅教师	得分

V. Database Design (20 points total)

Entity Store is associated with store number, store name and address etc. Entity commodity (商品) is associated with commodity number, commodity name, specification and price. Entity employee is associated with employee no, employee name, sex and performance. Each commodity can be sold in many stores and each store may sold many kinds of commodity. For each commodity in a certain store, the sale quantity must be recorded per month. For each store, there are many employees. For each employee, he can work for only one store. For each employee who works in a certain store, salary and work period must be recorded.

1. Construct an E-R diagram that captures the information above. **(10 points)**
2. Convert the E-R diagram to 3NF relations. Specify keys and referential integrity constraints. **(10 points)**