西 安 电 子 科 技 大 学

考试时间__120__分钟

试　　题

题号	一	二	三	四	五	总分
分数						

1. 考试形式：闭卷☑　开卷☐

2. 考试日期：　　年　　月　　日

3. 可中文作答，但请严格按照题目所给的关系及其属性的英文名称答题，不得随意更换。

班级：_____学号：_____ 姓名：_____任课教师：_____

I. Single choice questions (2 * 10 points)

There are 10 questions in this section. For each of them there are four choices marked A, B, C and D. You should decide on the ONLY best choice and write the corresponding letter into the square brackets.

1. **[_____] level describes what data are stored in the database, and what relationships exist among those data.**

   A. Physical　B. Logical　C. View　D. Table

2. **The [_____] clause(子句) allows us to select only those rows in the result relation of the from clause that satisfy a specified predicate.**

   A. order by　B. where　C. group by　D. from

3. **A [_____] is made visible to a user as a virtual relation.**

   A. trigger　B. view　C. function　D. procedure

4. **There is a constraint: "The budget of a department must be greater than $0.00", which constraint should be selected to implement it. [_____]**

   A. not null　B. foreign key　C. check　D. unique

5. **Which of the following normal form(范式) is not based on functional dependencies. [_____]**

   A. 1NF　B. 3NF　C. BCNF　D. 4NF

6. In the [_____] design phase, the designer maps the high-level conceptual schema onto the implementation data model of the database system.

A. conceptual B. logical C. physical D. applied

7. Which of the following statements about B+-tree index is wrong. [_____]

A. Each nonleaf(非叶子节点) node in the tree has between [n/2] and n children;

B. A B+-tree index takes the form of a balanced tree in which every path from the root of the tree to a leaf is of the same length;

C. In the B+-tree index, the search key can be null;

D. The nonleaf nodes of the B+-tree form a multilevel (sparse) index on the leaf nodes.

8. In transaction isolation(隔离) levels, [_____] isolation levels allows only committed data to be read, but does not require repeatable reads.

A. read uncommitted B. read committed

C. repeatable read D. serializable

9. Which of the following statements about The two-Phase Locking Protocol is wrong. [_____]

A. This protocol ensures conflict-serializable schedules;

B. In growing phase transaction may obtain locks but not release locks;

C. In shrinking phase transaction may release locks but not obtain locks;

D. This protocol ensures freedom from deadlocks(死锁).

10. There is a bug in the operating system, that causes the loss of the content of volatile storage, and brings transaction processing to a halt. This is which types of failure. [_____]

A. Transaction failure B. System crash

C. Disk failure D. Logical error

II. Relational Operations (25 points)

Consider the following database.

employee (<u>person_name</u>, street, city)

works (<u>person_name</u>, company_name, salary)

company (<u>company_name</u>, city)

1. Finish following queries using relational algebra expression(关系代数表达式).

(1) Get names of the employee whose company address is in 'Beijing';

(2) Get names of employees who live in 'Xi'an' and whose salary is greater than 10000;

2. Finish following requests using SQL statements(语句).

(1) Create table 'works', require primary and foreign key constraints.

(2) List the name of the employee whose salary is higher than the average salary of the company.

(3) List the name and total sum of salary of each company.

(4) Create a view containing all the information(person name, street, city, company name, salary) of employees working in Xi'an.

III. Transactions (20 points)

Let the initial values be X = 200, Y =200. Please answer the following questions.

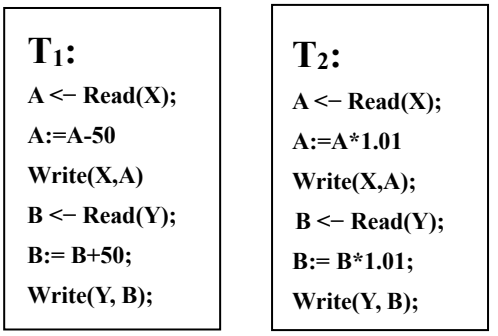

Figure 1

T_1	T_2
A <– Read(X);	
A:=A-50	
Write(X,A)	
	A <– Read(X);
	A:=A*1.01
	Write(X,A);
	B <– Read(Y);
B <– Read(Y);	
B:= B+50;	
Write(Y, B);	
	B:= B*1.01;
	Write(Y, B);

Figure 2

1. In Figure 1, two transactions T1 and T2 are executed one after another, list all possible serial scheduler(串行调度) and their results (values of X and Y) respectively;

2. Is the result of concurrent scheduler for the above transactions T1 and T2 shown as Figure 2 'RIGHT' or NOT? Why?

3. Introduce Slock(), Xlock() and Unlock() statement to the proper positions of the scheduler above, rewrite the scheduler to obey 2PL (two phase lock，两相锁) protocol, and list the results of the scheduler you rewritten.

IV. Relational database theory (20 points)

1. Given instr_dept (ID, name, salary, dept_name, building, budget).

(1) The schema dose not satisfy BCNF, WHY?

(2) Decomposing this Schema into BCNF.

2. Given R = (A, B, C, D， E) and F = {AB→C, B→D, C→E, EC→B, AC→B}.

(1) Calculate the attribute set closure(闭包) of AB.

(2) Is AB a candidate key?

V. Database design (15 points)

A university wants to build an educational administration system(EAS) to realize the informatization(信 息 化) of its teaching management.

The system manages students, teachers, courses and other information, including the following business rules,

1) One student can take multiple courses, and several students can take one course;

2) A teacher can teach multiple courses, and only one teacher can teach a course;

3) A student takes a course with only one grade.

The system needs to provide students with course selection function and provide transcripts(学生成绩报告单) according to the course selection results; The system provides teachers with the function of course score registration（登记成绩）.

Please create an Entity Relationship diagram that captures this information about the EAS system. Be sure to indicate the primary key.