浙江大学 2022–2023 学年春夏季学期

《数据库系统》课程课堂测试五

(Quiz 5 for Database Systems)

考生姓名：_____ 学号：_____ 专业：_____ 得分：_____

Problem 1. Consider the following relational schema and SQL query:

product(pid: char(10), name: char(20), producer: char(20), price: integer)
customer(cid: integer, name: char(20), age: integer; city: char(20))
order(cid: integer, pid: char(10))

assume that: The *product* table has 100,000 records
The *order* table has 2,000,000 records
The file system support 4K byte blocks.
There are 60 buffer pages (blocks) for operating join.
The attribute with 'integer' type needs 4 bytes.

Please estimate the best cost for evaluating **product** ⋈ **order** with Block Nested-Loop Join method.

The *product* table needs $(10 + 20 + 20 + 4) * 100{,}000/4K = 1350$ blocks.
The *order* table needs $(4 + 10) * 2{,}000{,}000/4K = 7000$ blocks.
Both of them is larger than 60 buffer pages.
If *product* is the outer relation, we need $\lceil 1350/(60-1) \rceil * 7000 + 1350 = 162350$ disk accesses.

$$\lceil 1350/(60-2) \rceil * 7000 + 1350 = 169350$$

If *order* is the outer relation, we need $\lceil 7000/(60-1) \rceil * 1350 + 7000 = 167650$ disk accesses.

$$\lceil 7000/(60-2) \rceil * 1350 + 7000 = 170350$$

Problem 2. Consider the following log sequence of transactions.

1. <T_1 start>
2. <T_1, A, 1, 2>
3. <T_2 start>
4. <T_2, B, 3, 4>
5. <T_3 start>
6. <T_3, C, 5, 6>
7. <checkpoint{T_1, T_2, T_3 } >
8. <T_1 commit>
9. < T_3, A, 2, 7>
10. < checkpoint{T_2, T_3 }>
11. < T_2, B, 4, 8>
12. < T_3 commit >
13. <T_4 start>
14. < T_4, A, 7, 9>
15. <T_5 start>
16. < T_5, C, 6, 10>

Supposing the system crashes just after the last log record. Please answer each of the following questions:

(1) What are the values of *A*, *B*, and *C* in the database after system crash?

A = 9; B=8; C=10

(2) Which transactions should be undone? Which transactions should be redone?

Undone: T2, T4, T5;

Redone: T3

(3) What are the start points for undo and redo processes respectively?

Undo: 16. < T5, C, 6, 10>

Redo: 9. < T3, A, 2, 7>

(4) What are the values of *A*, *B* and *C* after system recovery?

A=7; B=3; C=6