

浙江大学 2023–2024 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. $\langle T_1 \text{ start} \rangle$
2. $\langle T_1, A, 1, 2 \rangle$
3. $\langle T_2 \text{ start} \rangle$
4. $\langle T_2, B, 3, 4 \rangle$
5. $\langle T_3 \text{ start} \rangle$
6. $\langle T_3, C, 5, 6 \rangle$
7. $\langle \text{checkpoint}\{T_1, T_2, T_3\} \rangle$
8. $\langle T_1 \text{ commit} \rangle$
9. $\langle T_3, A, 2, 7 \rangle$
10. $\langle \text{checkpoint}\{T_2, T_3\} \rangle$
11. $\langle T_2, B, 4, 8 \rangle$
12. $\langle T_3 \text{ commit} \rangle$
13. $\langle T_4 \text{ start} \rangle$
14. $\langle T_4, A, 7, 9 \rangle$
15. $\langle T_5 \text{ start} \rangle$
16. $\langle T_5, C, 6, 10 \rangle$

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. $\langle T5, C, 6, 10 \rangle$

Redo: 9. $\langle T3, A, 2, 7 \rangle$

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

$A=7$; $B=3$; $C=6$