

本試題是否可以使用計算機：可使用，不可使用（請命題老師勾選）

考試日期：0302，節次：1

## 一 選擇題（每題 3 分）

- 1) Which of the following is NOT an advantage of database system?
    - A. Standards can be enforced
    - B. The data can be shared
    - C. Inconsistency can be avoided
    - D. Platform independence becomes a reality
  - 2) A database administrator is responsible for all the following except
    - A. Performance – ensuring maximum performance given budgetary constraints
    - B. Availability - Ensuring maximum uptime
    - C. Manage user account information
    - D. Security - Defining and/or implementing access controls to the data
  - 3) Which typing disciplines does SQL belong to?
    - A. Static, strong typing
    - B. Dynamic, weak typing
    - C. Combination of dynamic and static typing
    - D. None of the above
  - 4) Which of the following data structures is particularly well-suited for implementation of databases?
    - A. Queues
    - B. Hash tables
    - C. Sparse arrays
    - D. B-trees
  - 5) Which of the following accesses a database in terms of a database model?
    - A. Application software
    - B. Database management system
    - C. Actual database
    - D. None of the above
  - 6) Which of the following SQL keywords is used to combine rows with related values into elements of a smaller set of rows?
    - A. Having
    - B. Aggregate
    - C. Group by
    - D. Order by
  - 7) Which of the following relational operations is performed by the SQL statement below?  
Select A, B, C  
From X
- (背面仍有題目,請繼續作答)

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- A. Select  
 B. Project  
 C. Join  
 D. None of the above
- 8) Data is read into memory for processing, and written to disk for persistent storage, by a layer of software called
- A. Recovery manager  
 B. Disk space manager  
 C. Buffer manager  
 D. Cache manager
- 9) Which of the following is not a potential problem caused by multiple transactions manipulating a database at the same time?
- A. Lost update problem  
 B. Clustering  
 C. Deadlock  
 D. Incorrect summary problem
- 10) Which of the following file organizations has lowest delete cost?
- A. Sorted file  
 B. Unclustered tree index file  
 C. Heap file  
 D. Unclustered hash index file

二 For each of the terms in the left-hand column below, select the term in the right-hand column that best matches it. (每題 3 分)

- |                           |  |
|---------------------------|--|
| 1. _____ Schema           | A. The time at which a DBMS guarantees that a transaction's actions will be reflected in a database              |
| 2. _____ ER model         | B. The process of attempting to optimize the performance of a database by adding redundant data                  |
| 3. _____ Clustering       | C. A system to guard against database errors due to performing transactions concurrently                         |
| 4. _____ Commit point     | D. A description of the entire database structure that is used by the database software to maintain the database |
| 5. _____ Locking protocol | E. Main repository of an organization's historical   |

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- |                          |  |
|--------------------------|--|
| 6. _____ Data mining     | data   |
| 7. _____ Data warehouse  | F. The segmentation of logically sequential data, such as a single file, so that segments can be assigned to multiple physical devices |
| 8. _____ Denormalization | G. Allows one to describe the data involved in a real-world enterprise   |
| 9. _____ Data striping   | H. The process of extracting hidden information  |
| 10. _____ Access path    | I. A way of retrieving tuples from a table and consists of either (1) a file scan or (2) an index plus a matching selection condition  |
|                          | J. A disproportionate number of keys happen to hash to the same bucket   |

### 三 問答題

1. Consider the following schema:

Suppliers(sid: integer, sname: string, address: string)

Parts(pid: integer, pname: string, color: string)

Catalog(sid: integer, pid: integer, cost: real)

The key fields are underlined, and the domain of each field is listed after the field name. The Catalog relation lists the prices charged for parts by Suppliers. Answer the following questions with the above relation schema: (4\*4=16分)

- a. What does the following expression in relational algebra do? ( $\bowtie$  denotes 'join';  $\sigma$  denotes selection;  $\pi$  denotes projection)

$$\pi_{\text{sname}}(\pi_{\text{pid}}(\sigma_{\text{color}='red'} \text{Parts}) \bowtie (\sigma_{\text{cost}<100} \text{Catalog}) \bowtie \text{Suppliers}))$$

- b. What does the following expression in relational algebra do?

$$\rho(\text{Tempsids}, (\pi_{\text{sid}, \text{pid}} \text{Catalog}) / (\pi_{\text{pid}}(\sigma_{\text{color}='green'} \text{Parts})))$$

$$\pi_{\text{sname}}(\text{Tempsids} \bowtie \text{Suppliers})$$

- c. What does the following SQL statement do?

```
SELECT S.sname
```

```
FROM Suppliers S
```

```
WHERE NOT EXISTS ((SELECT *
```

```
FROM Parts P
```

```
EXCEPT
```

(背面仍有題目,請繼續作答)

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```
(SELECT C.pid
FROM Catalog C
WHERE C.sid = S.sid)
```

```
d. SELECT P.pid, S.sname
FROM Parts P, Suppliers S, Catalog C
WHERE C.pid = P.pid
AND C.sid = S.sid
AND C.cost = (SELECT MAX (C1.cost)
FROM Catalog C1
WHERE C1.pid = P.pid)
```

2. Answer the following questions regarding indexing:

- a. What is an index on a file of records? (3 分)
- b. What is a search key for an index? (3 分)
- c. Why do we need indexes? (3 分)
- d. What is a primary index (3 分)

3. Consider a relation R with five attributes ABCDE. You are given the following functional dependencies:  $A \rightarrow B$ ,  $BC \rightarrow E$ , and  $ED \rightarrow A$ . (12 分)

- a. List all keys for R.
- b. Is R in 3NF? Why?
- c. Is R in BCNF? Why?