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）

一 選擇題（每題 3 分）

1) Typically, for a given database, there is a structural description of the type of facts held in that database; this description is known as a _____.

   A. data warehouse

   B. schema

   C. system catalog

   D. none of the above

2) The statement "the relational schema should not have any partial functional dependency" is a direct requirement for which of the following normal forms?

   A. 1NF

   B. 2NF

   C. 3NF

   D. BCNF

3) Suppose an accounts database has a table of invoices, and each invoice is associated with a particular supplier. Supplier details (such as address or phone number) are kept in a separate table; each supplier is given a 'supplier number' to identify them. Each invoice record has a field containing the supplier number for that invoice. In this example, which of the following serves as a foreign key?

   A. Phone number in the supplier table

   B. Supplier number in the supplier table

   C. Supplier number in the invoice table

   D. None of the above

4) In database theory, a(n) _____ is a virtual or logical table composed of the result set of a query.

   A. partition

   B. view

   C. abstraction

   D. None of the above

5) Which of the following is not an advantage of distributed databases?

   A. Improved availability

   B. Less complexity

   C. Local autonomy

   D. Improved performance

6) Which of the following SQL keywords is used to identify which columns are used to sort the resulting data?

   A. Having

（背面仍有題目，請繼續作答）

    B. Aggregate

    C. Group by

    D. Order by

7) When we say SQL is declarative, we mean

    A. We only specify what we need, but we don't tell DBMS how to get the data.

    B. We must declare all variables we use in a SQL command.

    C. We must declare all functions we use in a SQL command.

    D. None of the above.

8) Entity-relationship model is used in the _____ stage of information systems development, including database development.

    A. feasibility study

    B. requirement analysis

    C. design

    D. implementation

9) Which of the following is an objective of selecting a data type?

    A. Improve data integrity

    B. Maximize storage space

    C. Constraint data manipulation

    D. Represent a small number of possible values

10) Which type of file organization is easiest to update?

    A. Tree indexed

    B. sequential

    C. hashed

    D. none of the above

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)

Left-hand column	Right-hand column
1. _____ Data independence	A. All or nothing
2. _____ Key constraint	B. Separation of data descriptions from programs
3. _____ Determinant	C. Each entity of the entity set can participate in at most one relationship in the relationship set
4. _____ Horizontal fragmentation	D. Number of records in a page
5. _____ Blocking factor	E. A field in one record pointing to a key field of another record
6. _____ Reduction factor	F. Possible phenomenon with relations that have not been normalized
7. _____ Normalization	G. Breaking a relation into subsets of rows of the

original relation

8. _____ Deletion anomaly　　　　H. Elimination of redundancy

9. _____ Atomicity in ACID　　　　I. Attribute on left-hand side of functional dependency

10. ____ Foreign key　　　　J. The fraction of tuples in a table that satisfies a given conjunct.

三 問答題

1. Answer the following questions with the following relation schema: (4*4=16 分)

    Saliors(sid: integer, sname: string, rating: integer, age: real)

    Boats(bid: integer, bname: string, color: string)

    Reserves(sid: integer, bid: integer, day: date)

    a. What does the following expression in relational algebra do? (>< denotes 'join')

    $$\pi_{sname}((\sigma_{bid=103}Reserves) >< Sailors)$$

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

    $$\rho(Tempsids, (\pi_{sid,bid} Reserves) / (\pi_{bid} Boats))$$
    $$\pi_{sname} (Tempsids >< Sailors)$$

    c. What does the following SQL statement do?

    ```
    SELECT S.sname
    FROM Sailors S
    WHERE S.sid NOT IN (SELECT R.sid
        FROM Reserves R
        WHERE R.bid IN (SELECT B.bid
                        FROM Boats B
                        WHERE B.color = 'red'))
    ```

    d.
    ```
    SELECT    S.rating, AVG(S.age) AS avgage
    FROM      Sailors S
    GROUP BY  S.rating
    Having    COUNT(*) > 1
    ```

（背面仍有題目,請繼續作答）

2. If you were about to create an index on a relation, what considerations would guide your choice? Discuss each of the following:
   a. The choice of primary index. (5 分)
   b. Clustered versus unclustered indexes. (5 分)

3. Given a relation R with 5 attributes ABCDE and the following functional dependencies: $A \rightarrow B$, $BC \rightarrow E$, and $ED \rightarrow A$. The relation has 3 keys: CDE, ACD, BCD. Does R belong to BCNF? Does R belong to 3NF? Explain why。(3+3 分)

4. A university database contains information about professors (identified by social security number, or SSN) and courses (identified by courseid). Professors teach courses; each of the following situations concerns the Teaches relationship set. For each situation, draw an ER diagram that describes it. (2*4=8 分)
   a. Every professor must each some course.
   b. Every professor teaches exactly one course (no more, no less), and every course must be taught by some professor.