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一 選擇題 (30%)

1) In which of the following data models the data is organized into a tree-like structure?
   A. Hierarchical model
   B. Network model
   C. Relational model
   D. Algebraic model
2) Which of the following refers to the immunity of user applications to make changes in the definition and organization of data?
   A. Atomicity
   B. Consistency
   C. Data independence
   D. Durability
3) Which of the following is a systematic way of ensuring that a database structure is suitable for general-purpose querying and free of certain undesirable characteristics that could lead to a loss of data integrity?
   A. Query optimization
   B. Normalization
   C. Query expansion
   D. None of the above
4) Which of the following relational algebra operators is used to filter out unwanted rows of a table?
   A. Selection
   B. Join
   C. Union
   D. Projection
5) Which of the following is the set of values allowed in an attribute?
   A. Attribute cardinality
   B. Attribute domain
   C. Attribute closure
   D. Attribute degree
6) The SQL operation "Selection" has the idempotent property. What does that mean?
   A. Multiple applications of the same selection have no additional effect beyond the first one.
   B. The order selections are applied has no effect on the eventual result.
   C. A selection whose condition is a conjunction of simpler conditions is equivalent to a sequence of selections with those same individual conditions.

(背面仍有題目,請繼續作答)

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D. None of the above

7) The view mechanism provides the support for

A. logical data independence B. physical data independence C. Platform independence D. Query Optimization

8) Which of the following is not true?

A. relational algebra is procedural B. relational calculus is declarative C. relational calculus is non-procedural D. relation algebra is declarative

9) The operation " R – S " will

A. return a relation instance containing all tuples occur in both R and S

B. return a relation instance containing all tuples occur in S but not R

C. return a relation instance containing all tuples occur in R but not S

D. return a relation instance containing all tuples not occur in both R and S

10) A non-prime attribute is an attribute that does not occur in any candidate key. The requirement that "no non-prime attribute in the table is functionally dependent on a part (proper subset) of a candidate key" is used to define which of the following normal forms?

A. 1NF

B. 2NF

C. 3NF

D. BCNF

二 For each of the terms in the left-hand column below, select the term in the right-hand column that best matches it. (30%)

1. _____ Data dictionary	A. A database operation that retrieves all records where some value is between an upper and lower boundary
2. _____ Entity-relationship model	B. A centralized repository of information about data such as meaning, relationships to other data, origin, usage, and format.
3. _____ Range query	C. A set of properties that guarantee that database transactions are processed reliably
4. _____ ISAM	D. A popular concurrency control protocol.
5. _____ ACID	E. Stores data from current and previous years — data extracted from the various operational databases of an organization.
6. _____ Candidate key	F. Set of attributes in a relation for which there are no two distinct tuples (rows) that have the

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same values for the attributes in this set.

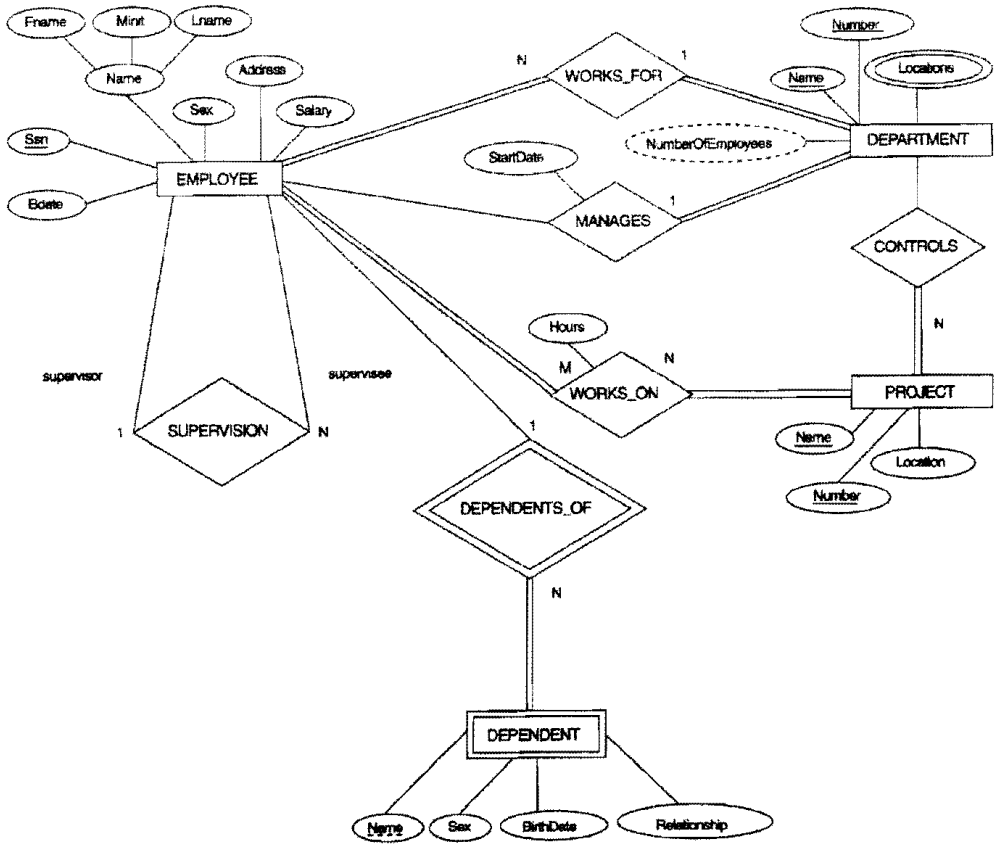
7. _____ Super key
8. _____ Database warehouse
9. _____ Two-phase locking
10. _____ Middleware

G. A method for indexing data for fast retrieval
H. Computer software that connects software components or applications
I. A minimal set of columns necessary to identify a row
J. An abstract and conceptual representation of data

三 問答題

1. Explain each of the following terms: A. referential integrity B. functional dependency C. Armstrong's Axioms D. Semijoin (8%)

2. Consider the following ER model



(背面仍有題目,請繼續作答)

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A. Define the four entities of the model and the attributes of each entity (4%)

B. Which of the entities are weak entities? Why? (2%)

C. In a large database, what is controlled redundancy? (2%)

3. Answer each of the following questions briefly. The questions are based on the following relational schema:

Emp(eid: integer, ename: string, age: integer, salary: real)
Works(eid: integer, did: integer, pct_time: integer)
Dept(did: integer, dname: string, budget: real, managerid: integer)

A. Give an example of a foreign key constraint that involves the Dept relation. What are the four options for enforcing this constraint when a user attempts to delete a Dept tuple? (10%)

B. Define the Dept relation in SQL so that every department is guaranteed to have a manager. (2%)

C. Write an SQL statement to give every employee a 10 percent raise. (2%)

4. For each of the following relations, identify the best normal form that the relation satisfies (1NF, 2NF, 3NF, or BCNF). If the relation is not in BCNF, decompose it into lossless-join BCNF relations. In each relation, the key fields are underlined. Additional functional dependencies are shown where appropriate. (10%)

A. Class(Course_No, Section_No)

B. Class(Course_No, Section_No, Room)

C. Class(Course_No, Section_No, Room, Capacity) Room → Capacity

D. Class(Course_No, Section_No, Course_Name, Room, Capacity)
Course_No → Course_Name, Room → Capacity