

第一部份：

1. What are the responsibilities of the DBA and the database designer? (10%)
2. What is the difference between a key and a superkey? (5%) Explain the differences among an entity, an entity type, and an entity set. (5%)
3. Consider the following relations for a database that keeps track of student enrollment in courses and the books adopted for each course:
STUDENT(Ssn, Name, Major, Bdate)
COURSE(Course#, Cname, Dept)
ENROLL(Ssn, Course#, Quarter, Grade)
BOOK_ADOPTION(Course#, Quarter, Book_isbn)
TEXT(Book_isbn, Book_title, Publisher, Author)

Specify the foreign keys for this schema, stating any assumptions you make. (10%)
4. What is a minimal set of functional dependencies? Does every set of dependencies have a minimal equivalent set? Is it always unique? (10%)
5. How is privacy related to statistical database security? What measures can be taken to ensure some degree of privacy in statistical database? (10%)

第二部份：

1. State whether the following conclusions are true or false: (10%)
 - a. $\text{NOT}(P(x) \text{ OR } Q(x)) \rightarrow (\text{NOT}(P(x)) \text{ AND } (\text{NOT}(Q(x))))$
 - b. $\text{NOT}(\exists x)(P(x)) \rightarrow \forall x(\text{NOT}(P(x)))$
 - c. $(\exists x)(P(x)) \rightarrow \forall x((P(x)))$
2. Show that $AB \rightarrow D$ is in the closure of $\{AB \rightarrow C, CE \rightarrow D, A \rightarrow E\}$ (10%)
3. A PARTS file with Part# as the key field includes records with the following Part# values: 23, 65, 37, 60, 46, 92, 48, 71, 56, 59, 18, 21, 10, 74, 78, 15, 16, 20, 24, 28, 39, 43, 47, 50, 69, 75, 8, 49, 33, 38. Suppose that the search field values are inserted in the given order in a B⁺-tree of order $p = 4$ and $p_{\text{leaf}} = 3$; show how the tree will expand and what the final tree will look like. (10%)
4. When are latches used? (10%)
5. How are multimedia sources indexed for content-based retrieval? (10%)