

1. Discuss the two-phase commit protocol used for transaction management in a DDBMS. List its limitations and explain how they are overcome using the three-phase commit protocol. (10%)
2. What are the properties of R-trees that act as an index for spatial data? (10%)
3. Discuss the deferred update technique of recovery. What are the advantages and disadvantages of this technique? Why is it called the NO-UNDO/REDO method? (10%)
4. Define Boyce-Codd normal form. How does it differ from 3NF? Why is it considered a stronger form of 3NF? (10%)
5. In what sense does relational calculus differ from relational algebra, and in what sense are they similar? (10%)
6. Discuss how each of the following constructs is used in SQL, and discuss the various options for each construct. Specify what each construct is used for. (10%)
 - a) Nested queries.
 - b) Joined tables and outer joins.
 - c) Aggregate functions and grouping.
 - d) Assertions and how they differ from triggers.
 - e) Schema change commands.
7. Describe the two alternatives for specifying structural constraints on relationship types. What are the advantages and disadvantages of each? (10%)
8. Compare and contrast the two main approaches to conceptual schema design. (10%)
9. Prove that a functional dependency satisfies the formal definition of multivalued dependency. (10%)
10. How do optimistic concurrency control techniques differ from other concurrency control techniques? Why are they also called validation or certification techniques? Discuss the typical phases of an optimistic concurrency control method. (10%)