



- Notes :
1. Due credit will be given to neatness and adequate dimensions.
 2. Assume suitable data wherever necessary.
 3. Illustrate your answer necessary with the help of neat sketches.
 4. Use of pen Blue/Black ink/refill only for writing the answer book.

1. a) Explain three levels of data abstraction with diagram. 6
b) Construct an E-R diagram for University database application. 7
A university has many departments. Each department has multiple instructors; one among them is the head of department. An instructor belongs to only one department. Each department offers multiple courses, each of which is taught by a single instructor. A student may enroll for many courses offered by different departments.

OR

2. a) Briefly explain following components in E-R diagram with suitable example. 6
i) Total participation ii) Ternary relationship
iii) Weak entity set
b) List and briefly explain the functions of DBA (Database Administrator). 7
3. a) Explain following keys with example. 6
i) Super key ii) Candidate key
iii) Primary key
b) For the following database schema: 7
Loan-schema = (loan_no, b_name, amount)
Borrower - Schema = (cust_name, Loan_no)
Account-Schema = (acc_no, b_name, balance)
Write queries using SQL:-
i) Find the names of all branches in the Loan relation.
ii) Find all loan numbers for Loans made at the SBI branch with loan amounts greater than Rs. 1200.
iii) For all customers who have a loan from the bank, find their names, Loan numbers and loan amount.

OR

4. a) For the following database schema 6
Borrower-schema = (Cust_name, loan_no, branch_name, amount)
Write the queries using tuple relational calculus.
i) Find tuples in borrower relation such that loan amount is more than Rs. 1200.
ii) Find only customer names in borrower relation such that loan amount is more than Rs. 1200.
b) Explain various outer join operations in relational algebra with example. 7

5. a) What is assertion? Write an assertion for:- 7
The sum of all loan amounts for each branch must be less than the sum of all account balances at the branch.
- b) Compute the closure of the following set F of functional dependencies for relation schema $R = (A, B, C, D, E)$. 7
 $A \rightarrow BC$
 $CD \rightarrow E$
 $B \rightarrow D$
 $E \rightarrow A$
List the candidate keys for R.

OR

6. a) Define following terms with example. 7
i) Referential Integrity ii) Trigger
- b) Explain with suitable example a relation is said to be in 1NF, 2NF & BCNF. 7
7. a) Draw and describe the steps involved in query processing. 7
- b) Let relations $r_1 (A, B, C)$ and $r_2 (C, D, E)$ have the following properties: 7
 r_1 has 20,000 tuples, r_2 has 45,000 tuples, 25 tuples of r_1 fit on one block and 30 tuples of r_2 fit on one block.
Estimate the Number of block accesses required, using each of the following join strategies for r_1 join r_2 .
i) Nested loop join ii) Block nested-loop join
iii) Merge join

OR

8. a) Explain the two basic algorithms to implement the selection operations. 7
- b) What do you mean by query optimization? Explain cost based optimization with example. 7
9. a) Describe ACID properties, Explain usefulness of each. 6
- b) Justify the following statement: 7
Concurrent execution of transactions is more important when data must be fetched from (slow) disk or when transactions are long, and is less important when data is in memory and transactions are very short.

OR

10. a) What is serializability? Explain the distinction between serial schedule and serializable schedule. 7
- b) How is atomicity and durability of a transaction implemented by the recovery management. 6
11. a) Explain the time-stamp based protocols with example. 7
- b) What is deadlock? Explain deadlock detection and recovery? 6

OR

12. a) Explain multiple granularity concurrency control scheme. 7
- b) List and explain the various types of failures occur in database system? 6
