



- Notes :
1. All questions carry marks as indicated.
 2. Solve Question 1 OR Questions No. 2.
 3. Solve Question 3 OR Questions No. 4.
 4. Solve Question 5 OR Questions No. 6.
 5. Solve Question 7 OR Questions No. 8.
 6. Solve Question 9 OR Questions No. 10.
 7. Solve Question 11 OR Questions No. 12.
 8. Due credit will be given to neatness and adequate dimensions.
 9. Assume suitable data whenever necessary.
 10. Illustrate your answers whenever necessary with the help of neat sketches.

1. a) Consider the following relational database and give the relational algebra for each of the following. 6
- Employee (Person_name, street, city)
 Works (Person_name, company_name, salary)
 Company (Company_name, city)
 Manages (Person_name, manager_name)
- Underline columns are the primary keys.
- 1) Find the names of all employees who work for SBI.
 - 2) Find the names and cities of residence of all employees who work for SBI.
 - 3) Find the names, street address, and cities of residence of all employees who work for SBI and earn more than \$10,000 per annum.
 - 4) Find the names of all employees in this database who live in the same city as the company for which they work.
 - 5) Find the names of all employees who do not work for SBI.
 - 6) Find the names of all employees who earn more than every employee of SBI.
- b) What is Data Independence? What are its types? Why it is needed? What are severe effects that may cause if an application is not data independent? 7
- OR**
2. a) What are the drawbacks of file processing system? Explain. 7
- b) Write short notes on: 6
- i) Tuple calculus.
 - ii) Data Abstraction.
3. a) What are bitmap indices? What is its use? Explain with example. 5
- b) Construct a B⁺ Tree for the following set of key values (2,3,5,7,11,17,19,23,29,31) for the following given order. Assume the tree initially empty. 8
- i) Four
 - ii) Six
 - iii) Eight
- OR**
4. a) What is Dynamic Hashing? What are its advantages over static hashing? Explain the mechanism of dynamic Hashing. 7

- b) Differentiate between the following. 6
- i) B and B⁺ Trees.
 - ii) Sparse index & dense index.
5. a) What are strong entities and weak entities? Draw an ER diagram illustrating the use of strong entity, weak entity, composite attribute, multivalued attributes & derived attributes. 8
- b) Explain 4NF and 5NF with example. 6
- OR**
6. a) Explain E.F Codd's relational database rules. 6
- b) What is data dictionary? Explain its use with example. 4
- c) Explain BCNF with example. 4
7. a) What are different equivalence rules present in transformation of relational expressions. 6
- b) Explain Materialization. 4
- c) Describe the advantages of pipelining. Explain when the pipelining cannot be used. 4
- OR**
8. a) What are Materialized views? Explain in detail. 7
- b) Explain Query optimization in detail. 7
9. a) Define Transactions. Explain ACID properties. 3
- b) What is Serializability? Discuss various types of Serializability. 7
- c) What is Checkpoint? Explain. 3
- OR**
10. a) What are deadlocks? How is deadlock detection and prevention achieved in DBMS. 7
- b) Explain how timestamp based protocols avoids the conflicts between transactions. 6
11. a) Consider the relation customer (Id, name, age, address, salary). Write a trigger that would fire for insert or update or delete operations performed on customer table. 7
- b) Write short notes on. 6
- i) Embedded SQL
 - ii) Dynamic SQL
- OR**
12. a) Consider the relation customer (Id, name, age, address, salary). Write a PL/SQL function that will return total number of customers in the customer table. 5
- b) What is Trigger? What are its different types? What is its necessity? Explain with example. 4
- c) Explain authorization concept in SQL. 4
