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- 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. Assume suitable data whenever necessary.
 9. Illustrate your answers whenever necessary with the help of neat sketches.

1. a) What do you mean by data abstraction? Explain three levels of data abstraction and also three level architecture of database system with reference to above levels. **7**
- b) Explain four relational algebra operation in detail with example. **6**

OR

2. a) Let $R = (A, B, C)$ and let r_1 and r_2 both be relations on schema R give an expression in domain relational calculus that is equivalent to **6**
- i) $\pi_A(r_1)$
 - ii) $\sigma_{B=17}(r_1)$
 - iii) $r_1 \cup r_2$
 - iv) $r_1 - r_2$
- b) Differentiate between file processing system and DBMS. **7**
3. a) List various file organization methods & explain different ways of organizing records in a file **7**
- b) Differentiate between the following **6**
- i) B and B^+ tree
 - ii) Sparse index and Dense index

OR

4. a) Construct B^+ tree for the following set of key values – (2, 3, 5, 7, 11, 17, 19, 23, 29, 31). Assume that the tree is initially empty and the number of pointers that will fit in one mode is **8**
- i) $n = 4$
 - ii) $n = 6$
 - iii) $n = 8$
- b) What are bitmap indices? What is its use? Explain with example. **5**

5. a) What are strong entities and weak entities? Draw an ER diagram illustrating the use of strong entity, weak entity, composite attribute, multivalued attribute and derived attributes. 8
- b) Explain E. F. Codd's relational database rules. 6

OR

6. a) Consider the relation schema $R(A, B, C, D, E)$ and set F of functional dependency $F = \{AB \rightarrow CE, E \rightarrow AB, C \rightarrow D\}$ 7

What is the highest normal form of this relation? Explain.

Also find its prime, non prime attributes along with several candidate keys.

- b) What is data dictionary? Explain its use with example. 3
- c) Explain BCNF with example. 4
7. a) What are different equivalence rules present in transformation of relational expression? 6
- b) What are materialized views? Explain in details. 7

OR

8. a) What is query processing? Explain each steps involved in query processing with proper diagram. 7
- b) How an expression can be evaluated with help of materialization and pipeline approach. Explain in detail. 6
9. a) Explain transaction with neat sketch diagram. Explain ACID properties in brief. 6
- b) What is serializability? Discuss various types of serializability. 7

OR

10. a) What are deadlocks? How is deadlock detection and prevention achieved in DBMS. 7
- b) Explain different concurrency problems and give solutions for it. 6
11. a) Explain various types of JOIN expressions with example. 7
- b) What is nested sub query? Explain with the help of example. 7

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 customer table. 4
- b) Enlist and explain with example, various DDL commands. 6
- c) Explain dynamic SQL and embedded SQL. 4



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High expectations are the key to everything.

~ Sam Walton

