**December 2023**
**B.Tech (CE/IT/CE(Hindi Medium)/CSE(AIML)/CSE) 5th Sem., December 2023**
**Database Management Systems (PCC-CS-501)**

**Duration: 3 Hours** **Max. Marks: 75**

## Instructions:

- It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.
- Answer any four questions from Part-B in detail.
- Different sub-parts of a question are to be attempted adjacent to each other.

## Part-A

**Q1** (a) What do you mean by referential integrity constraint? (1.5)
(b) Explain mapping cardinality with an example. (1.5)
(c) Name the categories of SQL commands. (1.5)
(d) State the levels of data abstraction in DBMS? (1.5)
(e) Distinguish between super key and candidate key. (1.5)
(f) What do you mean by vertical fragmentation in distributed databases?
(g) Illustrate division operation in relation algebra. (1.5)
(h) What is rigorous two phase locking protocol? (1.5)
(i) Define upgrade and downgrade in context of locking. (1.5)
(j) When is a transaction rolled back? (1.5)

## Part-B

**Q2** (a) What is Serializability? Consider the transactions T1, T2, and T3 and the schedules S1 and S2 given below. Analyze which one of the schedules is conflict-serializable? (10)

**Transactions:**
T1: r1(X); r1(Z); w1(X); w1(Z)
T2: r2(Y); r2(Z); w2(Z)
T3: r3(Y); r3(X); w3(Y)

**Schedules:**
S1: r1(X); r3(Y); r3(X); r2(Y); r2(Z); w3(Y); w2(Z); r1(Z); w1(X); w1(Z)
S2: r1(X); r3(Y); r2(Y); r3(X); r2(Z); r1(Z); w3(Y); w1(X); w2(Z); w1(Z)

(b) Mention few features of distributed databases? (5)

**Q3** (a) Explain different database users. What are the responsibilities of a DBA? (5)

(b) Construct an E-R diagram for a car insurance company whose customers own one or more cars each. Each car has associated with it zero to any number of recorded accidents. Each insurance policy covers one or more cars, and has one or more premium payments associated with it. Each payment is for a particular period of time and has an associated due date, and the date when the payment was received? (10)

**Q4** (a) Explain the components of DBMS with a neat diagram. (10)

(b) Write the inference rules of functional dependency. (5)

**Q5** (a) Consider following schema and represent given statements in relation algebra form. (6)

**Schema:**

- Branch(branch_name, branch_city)
- Account(branch_name, acc_no, balance)
- Depositor(Customer_name, acc_no)

(i) Find out the list of customers who have an account at the 'abc' branch.

(ii) Find out all customer names who have an account in 'Ahmedabad' city and balance is greater than 10,000.

(iii) Find out the list of all branch names with their maximum balance.

(b) For query no. (ii) in above part (a), draw the query tree and hence optimize it. (4)

(c) What is database security? Explain types of database security. (5)

**Q6** (a) What do you mean by hashing? Explain any one hashing technique with an example. (5)

(b) What is KDD? Explain about data mining as a step in the process of knowledge discovery. (5)

(c) What do you mean by 2-phase locking? Explain concurrency control based on time-stamp ordering. (5)

**Q7** (a) Explain immediate database modification log-based recovery method. Also Explain role of check point in log base. (10)

(b) Given a relation R (A, B, C, D) and Functional Dependency set FD = {AB $\rightarrow$ CD, B $\rightarrow$ C}, determine whether the given R is in 2NF? If not convert it into 2NF. (5)

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