

1C8114

Roll No. _____

Total No. of Pages: **4****1C8114****M.C.A. I-Sem. (Main / Back) Exam., 2026****MCA-105 Database Systems****Time: 3 Hours****Maximum Marks: 70****Min. Passing Marks: 28***Instructions to Candidates:*

Attempt all Ten questions from Part A. All five questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (As mentioned in form No. 205)

1. NIL2. NIL**PART – A****[10×2=20]****(Word limit 25)**

Q.1 List the three layers and their significance in the architecture of a DBMS.

Q.2 What is a Tuple?

Q.3 What is a Transaction?

Q.4 Write the significance of 'Atomicity'.

Q.5 What does the relational algebra notation $\sigma_{\text{department} = \text{"sales"} \wedge \text{commission} \geq 5000}$

(Employee) represent?

- Q.6 In tuple relational calculus what does ' $\exists t \in r(Q(t))$ ' mean?
- Q.7 What is authorization in DBMS?
- Q.8 What is a Distributed Database?
- Q.9 Write an SQL query to return the number of students whose score is greater than 75 from 'Semester1' table.
- Q.10 Which SQL clause is used in the SELECT statement to group rows that have the same values for a given column? Give example.

PART - B

[5×4=20]

(Word limit 100)

- Q.1 Explain the Foreign key constraint with an example.
- Q.2 Explain the different States of Transactions with examples.
- Q.3 Describe the steps in Query Processing.
- Q.4 Discuss Shadow Paging and its importance as a database recovery technique.
- Q.5 What is an aggregate function in SQL? Explain any three aggregate functions with examples.

PART – C

[3×10=30]

(Attempt any three questions)

- Q.1 (a) Construct an ER diagram for a Banking System. Clearly indicate the entities, relationships, cardinality and the key constraints. As per the Banking System requirements,

A person opens an Account in a Bank and gets an account number and an ATM card. The person can make transactions in ATM centers and the details of the transactions are stored in database tables.

Write assumptions made by you (if any) while constructing the ERD.

- (b) Explain the first three Normal Forms (1NF, 2NF, 3NF) in detail with example(s).

- Q.2 What is Serializability? Explain different types of Serializability with examples. <https://www.pyqonline.com>

- Q.3 Explain the different types of Concurrency Control Protocols with examples.

- Q.4 Consider the following tables :

Customer

First Name	Last Name
Sandeep	Jain
Manoj	Sharma
Dinesh	Khanna
Pranay	Joshi
Richa	Arora

Employee

First Name	Last Name
Charu	Johar
Mitali	Mohan
Pranay	Joshi
Sandeep	Jain
Richa	Singh

- (i) Write SQL queries to perform UNION, UNION ALL, MINUS and INTERSECT set operations on the above tables. Also write the results of each of these operations.
- (ii) Write the difference between UNION and JOIN operations using the above tables.

Q.5 Write short notes on :

- (i) Distributed Databases
- (ii) Failure Classifications
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