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Brainware University
398, Ramkrishnapur Road, Barasat
Kolkata, West Bengal-700125

BRAINWARE UNIVERSITY

Term End Examination 2025-2026
Programme – Dip.CSE-2024
Course Name – Introduction to DBMS
Course Code - DCS40112
(Semester IV)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A
(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) Identify the relational query language that uses mathematical-like notation for expressing queries.

a) SQL b) SQL3
c) Relational Algebra d) NoSQL

(ii) Select the key factor that leads SQL relations to be treated as multisets instead of sets.

a) They lack attributes. b) They permit duplicate tuples.
c) They only contain numbers. d) They are always empty.

(iii) Select the correct meaning of Armstrong's axioms in the context of relational database design.

a) A set of inference rules for relational databases b) A type of join operation
c) Constraints on primary keys d) Indexing technique

(iv) Select the relational algebra operator that yields a "vertical subset" by selecting specified columns and eliminating duplicate rows.

a) Selection (σ) b) Join (⋈)
c) Projection (π) d) Union (∪)

(v) Choose the definition of a super-key according to the sources.

a) A set of nullable attributes b) A key with no subsets
c) A set of attributes that uniquely identifies tuples d) A foreign key reference

(vi) Select the correct query to prevent negative salary values.

a) Salary INT b) Salary INT UNIQUE
c) Salary INT CHECK(Salary>0) d) Salary INT DEFAULT 0

(vii) Select weak entity in the context of the ER model.

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a) An entity without any attributes
b) An entity with a composite primary key
c) An entity that cannot exist without being related to another entity
d) An entity with a single-valued attribute

(viii) Identify the symbol that is used to represent derived attribute.

a) dotted eclipse
b) eclipse
c) Dotted rectangle
d) Rectangle

(ix) Choose the correct SQL query to add a column 'Email' to an existing table STUDENT.

a) ALTER STUDENT ADD Email VARCHAR(50);
b) ALTER TABLE STUDENT ADD Email VARCHAR(50);
c) UPDATE STUDENT ADD Email;
d) CREATE Email IN STUDENT;

(x) Identify the option that is not a type of DBMS model.

a) Object-oriented
b) Relational
c) Sequential
d) None of these

(xi) Choose the primary advantage of using a clustered index over a non-clustered index in database storage.

a) Improved search performance
b) Decreased storage space
c) Efficient insert and delete operations
d) Support for complex queries

(xii) Choose the term used in a B-tree for the number of child nodes each internal node can have.

a) Branching Factor
b) Degree
c) Fanout
d) Leaf Nodes

(xiii) Choose the context of transaction processing, the acronym ACID stands for.

a) Atomicity, Consistency, Integrity, Durability
b) All, Commit, Isolation, Data
c) Automatic, Concurrent, Index, Delete
d) Atomicity, Consistency, Isolation, Durability

(xiv) Identify the type of lock that allows other transactions to read but not modify the data that is locked.

a) Shared Lock
b) Exclusive Lock
c) Read Lock
d) Write Lock

(xv) Select the purpose of the write-ahead log.

a) To record changes before they are applied to the database
b) To track the timestamp of each transaction
c) To manage concurrent access to the database
d) To log the completed transactions

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Compare natural join and Cartesian product in relational algebra. (3)
3. Illustrate the Selection (σ) operation of Relational Algebra with a suitable example. (3)
4. Ask about the significance of Armstrong's Axioms in relational database design. (3)
5. Define data independence and it's types. (3)
6. Classify different types of database access control models with examples. (3)

OR

Evaluate the effectiveness of role-based access control (RBAC) in large-scale database systems. (3)

Group-C

(Long Answer Type Questions) 5 x 6=30

7. Illustrate SQL queries to perform the following operations on an EMPLOYEE table: a) Insert a new record into the table. b) Update the salary of an existing employee. c) Delete an employee record based on EmployeeID. (5)

8. Apply a self join on the Employee(EmpID, Name, ManagerID) table to list all employees along with the names of their managers. Write the SQL query and its relational algebra equivalent. (5)
9. Distinguish between WHERE and HAVING clauses in SQL. (5)
10. Illustrate the use of BETWEEN operator in SQL with an example. (5)
11. Evaluate the need for locks in DBMS with an example. (5)
12. Compare strict 2-phase locking with basic 2-phase locking. (5)

OR

Compare the performance of B+ trees and hash indices for range queries. (5)

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