R.N.G.PATEL INSTITUTE OF TECHNOLOGY-RNGPIT
(An Autonomous Institute U/s UGC Act 1956)

B.Voc. SEMESTER-I, SEMESTER END EXAMINATION – WINTER 2025

SUBJECT CODE: 1SD101   **DATE: 15-12-2025**

SUBJECT NAME: DATABASE MANAGEMENT SYSTEM

TIME: 11:00 AM to 01:00 PM   **TOTAL MARKS: 50**

Instructions

1. It is **compulsory** for students to write **Enrolment No. /Seat No.** on the question paper.
2. Attempt all questions in the question paper.
3. The figures to the right of each question indicate full marks. Make suitable assumptions with proper justification wherever required.
4. Simple, non-programmable scientific calculators are permitted.
5. BL - Cognitive Level (As per Revised Bloom's Taxonomy) (R-Remember, U-Understanding, A –Application, N –Analyze, E – Evaluate, C -Create), CO - Course Outcomes.

			Marks	BL	CO
Q.1	**(a)**	List the functions or responsibilities of a Database Administrator (DBA).	**05**	**R**	**1**
	(b)	Consider the following relations:	**05**	**A**	**1**

STUDENT (stud_id, stud_name, course_id, dob, gender, marks, dept_id)

COURSE (course_id, course_name, credits, dept_id)

DEPARTMENT (dept_id, dept_name, location)

Apply relational algebra operations to answer any **five** from the following:

1. Apply selection operation to find students who have scored more than 80 marks.
2. Formulate a relational algebra expression to list all students enrolled in "Computer Science" department.
3. Use join operation to display students along with their course names.
4. Construct a relational algebra query to find students who are enrolled in the same department as "John".
5. Write a relational algebra expression to find students who are taking courses having more than 4 credits.
6. Demonstrate the use of aggregation to find the highest marks in each department.
7. Apply selection criteria to retrieve students whose date of birth is before 1-Jan-2000.

Q.2	**(a)**	Explain the concept of normalization in databases. List the different normal forms, and describe any one normal form in your own words with a suitable example.	**05**	**U**	**2**
	(b)	Using the concepts of Generalization and Specialization, apply them to show how different types of employees can be represented in an EER diagram.	**05**	**A**	**2**

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Q.2	**(a)**	Explain the concept of Mapping Cardinality in the Entity-Relationship Model. Describe the different types of mapping cardinalities with suitable examples.	**05**	**U**	**2**
	(b)	Given a relation R(A, B, C, D) with the following dependencies: $A \rightarrow B$, $B \rightarrow C$, and $A \rightarrow D$, apply the concept of Functional Dependency to:	**05**	**A**	**2**

      1. Identify all possible candidate keys of the relation.
      2. Determine if the relation is in 2NF. Justify your answer.

Q.3	**(a)**	Explain the working of a Query Processor in a Database Management System with the help of a neat and labeled diagram. Describe the functions of each component involved.	**05**	**U**	**3**
	(b)	Apply the concept of Evaluation of Expression to show how a relational algebra query is executed step by step using a simple example.	**05**	**A**	**3**

<div align="center">OR</div>

Q.3	**(a)**	Explain the concept of Query Optimization. Describe the steps involved in the Query Optimization process and explain why optimization is important in query execution.	**05**	**U**	**3**
	(b)	Use the idea of Transformation of Relational Expression to simplify a relational algebra expression with the help of an example.	**05**	**A**	**3**

Q.4	**(a)**	Explain what is Conflict Serializability and View Serializability.	**05**	**U**	**4**
	(b)	Apply the concept of Deadlock to show a simple example where two transactions wait for each other's resources.	**05**	**A**	**4**

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Q.4	**(a)**	Explain the Two-Phase Commit Protocol (2PC) used in a distributed database system.	**05**	**U**	**4**
	(b)	Apply the ACID properties to a bank transaction example and explain how they maintain data correctness.	**05**	**A**	**4**

Q.5	**(a)**	Write SQL commands to create a table named Students using DDL queries and insert five records into it using DML queries. The table should have the following columns and constraints:	**05**	**A**	**5**

StudentID (Integer, Primary Key) , **Name** (String, Not Null), **Email** (String, Unique), **Age** (Integer, must be greater than 17), **Course** (String)

	(b)	Explain the concept of Cursors in PL/SQL.	**05**	**U**	**5**

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OR

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Q.5	**(a)**	Write SQL queries to create a table named Orders and insert sample data into it. The table should include these columns and constraints: **OrderID** (Integer, Primary Key), **CustomerName** (String, Not Null), **ProductName** (String), **Quantity** (Integer, must be greater than 0), **OrderDate** (Date, Not Null)	**05**	**A**	**5**
	(b)	What is TCL (Transaction Control Language)? Explain the different TCL commands along with their purpose and basic syntax.	**05**	**U**	**5**

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