

Bharati Vidyapeeth's
Institute of Computer Applications and Management (BVICAM)
 A-4, Paschim Vihar, New Delhi-63
FIRST SEMESTER [MCA] Internal Examination, October 2025

Paper Code: MCA-107	Subject: Database Management Systems
Time: 2 Hours	Maximum Marks: 45

Note: Attempt THREE questions in all. Question No. 1 is compulsory, and attempt one question from each unit.

1. Answer all the following questions briefly: - 1.5 × 10 = 15
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| (a) Evaluate the concept of data independence in a database system. Compare and contrast logical and physical data independence | CO1 |
| (b) Design a simple database schema with two related tables (e.g., CUSTOMER and ORDERS) and explain how referential integrity is enforced between them. | CO1 |
| (c) Analyze the users of a database by categorizing them according to their roles and access levels. Explain the responsibilities and privileges associated with each category | CO1 |
| (d) Examine the impact of data redundancy and integrity on database performance. | CO1 |
| (e) Evaluate the role of DDL commands in SQL. and justify their impact on database structure and integrity. | CO1 |
| (f) Analyse the concept of an Identifying Relationship in an Entity-Relationship model. Explain how it differs from a non-identifying relationship and illustrate with an example of entities where an identifying relationship is necessary. | CO2 |
| (g) Explain the following: | CO2 |
| (i) Tuples | |
| (ii) Cardinality | |
| (iii) Degree/Arity | |
| (h) Differentiate between LEFT OUTER JOIN and RIGHT OUTER JOIN in SQL. Illustrate your answer with a simple example showing the result of each join | CO2 |
| (i) Explain the concept of nested queries (subqueries) in SQL. Evaluate their usefulness in retrieving complex data, and provide one example demonstrating a practical use case | CO2 |
| (j) Compare Schemas and Instances in a database in a tabular format. Explain their roles and why both are necessary for designing and managing data models. | CO2 |

UNIT - I

2. Evaluate the differences between Hierarchical, Network, and Relational Database Management Systems (DBMS) in terms of structure, data access, scalability, and ease of use. 5 CO1
- A research institute is conducting studies on scientific experiments and researchers. Each experiment can involve multiple researchers, and each researcher can participate in multiple experiments. Some experiments are classified, while others are public. Researchers can have different roles in an experiment (e.g., Lead, Assistant, Analyst). Additionally, some researchers belong to multiple departments, and each department may oversee several experiments. 5 CO1
- Draw an Enhanced Entity-Relationship (EER) diagram, Evaluate the relationships, entities, and attributes in this scenario.
- (c) Design a theoretical explanation of the three-level DBMS architecture and 5 CO1

describe how it provides logical and physical data independence.

3. (a) Compare relational and non-relational databases for handling large-scale unstructured data. Which approach would you choose for real-time analytics and why? 5 CO1
- (b) A motor vehicle sales company sells motorcycles, passenger cars, vans, and buses. 5 CO1
- (i) Design a generalisation-specialisation hierarchy for the vehicles in the company. Assign and justify the placement of attributes at each level of the hierarchy (e.g., why certain attributes belong to the general 'Vehicle' entity and others to specific subtypes).
- (ii) Explain why each attribute should **not** be placed at a higher or lower level in the hierarchy.
- (c) Evaluate the concept of mapping constraints in an Entity-Relationship (ER) model. Compare different types of mapping constraints (one-to-one, one-to-many, many-to-many). 5 CO1

UNIT - II

4. (a) Compare and contrast inner joins and outer joins in SQL. In which scenarios would you prefer one over the other, and why? 5 CO2
- (b) Evaluate which employees in the "IT" department earn more than Rs. 70,000 and retrieve only their employee ID, name, and salary. Write the **relational algebra expression** and justify why the combination of selection and projection is necessary.
Employee (EmpID, Name, Dept, Salary, JoiningDate) 5 CO2
- (c) Consider the following database schema: 5 CO2

EMPLOYEE (emp_code, emp_name, designation, DOJ, basic, dept_code)

DEPARTMENT (dept_code, dept_name, floor)

- (i) List the department names and floor numbers of all employees whose designation is "Manager."
- (ii) List the names and designations of employees who work on the 2nd floor of the building.
5. (a) Evaluate the differences between the **HAVING** and **WHERE** clauses in SQL. In your answer, compare their functionality, usage context, and impact on query results. Justify scenarios where one is preferred over the other 5 CO2
- (b) Discuss the concept of union compatibility in relational algebra. Evaluate why it is necessary to perform set operations like UNION, INTERSECTION, and DIFFERENCE, and illustrate with examples where two relations are or are not union compatible. Justify the implications of incompatibility on query results 5 CO2
- (c) Evaluate the different types of relational integrity constraints: Entity Integrity, Referential Integrity, Domain Constraints, and Key Constraints. Compare their roles in ensuring data consistency and reliability, 5 CO2
