(Affiliated to University of Mumbai)	***End Semester Examination (R-24) SH 2025 Answer Key with marking scheme***
Branch: Electronics & Computer Science	Course: Database Management Systems
Year/ Semester: S.E/ III	Course code: ECC303
Time: 03 hours	Marks: 80

		Marks
Q. 1	Attempt any FOUR. (All questions carry equal marks)	
A.	i. Definition / Introduction of DBMS users – 1 M ii. Listing and explanation of at least 4 types of users – 1 M iii. Database Administrator – 1 M iv. Database Designer – 1 M v. End Users (with subtypes) – 1 M Each point -1 M Five points -5 M	5
B.	Introduction / Definition of Multimedia Database – 1 M i. Listing four contents – 1 M ii. Explanation of Text Data -1M iii. Explanation of Image / Audio / Video-2 M.	5
C.	Each correct query awarded with 1 M a) $\sigma_{Dept='Sales'}(EMPLOYEE)$ b) $\pi_{EmpName, Salary}(EMPLOYEE)$ c) $\sigma_{Salary > 50000}$ (EMPLOYEE) d) σ $D_{ept='Sales' \vee Dept='Marketing'}$ (EMPLOYEE) e) $\rho_{EMP}(EMPLOYEE)$	5
D.	i. Definition of Transaction: 1 M ii. Explanation of Active state: 1 M iii. Explanation of Partially Committed, Committed, Failed, Aborted states: 2 M iv. State Diagram (correct and labeled): 1 M	5
E.	i) Definition of Trigger: 1 M ii) Correct Syntax: 2 M iii) Example showing functionality: 2 M	5
F.	i) Definition of Functional Dependency: 1 M ii) Listing types of FDs: 2 M iii) Illustration/Example of any one type: 2 M	5
Q.2	Attempt any FOUR. (All questions carry equal marks)	
A.	i. Three-layer schema diagram: 2 M ii. Explanation of External, Conceptual, Internal levels: 3 M iii. Definition of Data Independence: 1 M iv. Explanation of Logical and Physical Data Independence with examples: 4 M.	10
B.	Each Correct query awarded with 2 M	10

	i) List the names of suppliers who supply red parts: SELECT DISTINCT S.Sname FROM Suppliers S JOIN Catalog C ON S.Sno = C.Sno JOIN Parts P ON C.Pno = P.Pno WHERE P.Colour = 'Red'; **ii) Find the total number of parts supplied by each supplier:** SELECT S.Sname, COUNT(C.Pno) AS TotalParts FROM Suppliers S JOIN Catalog C ON S.Sno = C.Sno GROUP BY S.Sname; **iii) Find the average cost of each part:** SELECT P.Pname, AVG(C.Cost) AS AvgCost FROM Parts P JOIN Catalog C ON P.Pno = C.Pno GROUP BY P.Pname; **iv) List the suppliers who supply at least one part costing more than 1000:** SELECT DISTINCT S.Sname FROM Suppliers S JOIN Catalog C ON S.Sno = C.Sno WHERE C.Cost > 1000; **v) Insert a new part record (Assume values):** INSERT INTO Parts (Pno, Pname, Colour) VALUES ('P05', 'Gear', 'Blue');	
C.	i. Definition of Conflict Serializability: 2 M ii. Example of Conflict Serializability (with precedence graph): 2 M iii. Definition of View Serializability: 2 M iv. Example of View Serializability (with explanation): 2 M v. Comparison / Key points: 2 M	10
D.	i) EER Diagram: Correct entities, attributes, relationships, cardinalities → 4 M ii) Relational Mapping: Correct mapping of entities to tables with primary keys - 2 M iii) Mapping of Relationships: Correct handling of many-to-many, one-to-many relationships → 2 M iv) Assumptions & Clarity: Clearly stated assumptions, readable diagram/text representation → 2 M	10
E.	Definition of Deadlock – 2 M Deadlock Prevention Methods – 4 M Example(s) – 4 M	10

F.	1. **Need for Normalization – 2 M** Explain why normalization is required: ▪ To reduce redundancy ▪ To avoid anomalies (insertion, update, deletion) ▪ To improve data integrity 2. **Explanation of 1NF, 2NF, 3NF, and BCNF – 4 M** ▪ 1NF (First Normal Form): Eliminate repeating groups; each attribute contains atomic values. ▪ 2NF (Second Normal Form): Meet 1NF; remove partial dependencies (attributes dependent on part of a composite key). ▪ 3NF (Third Normal Form): Meet 2NF; remove transitive dependencies. ▪ BCNF (Boyce-Codd Normal Form): Meet 3NF; every determinant is a candidate key. 3. **Examples – 4 M** ▪ Provide suitable examples for each normal form showing the table structure before and after normalization. ▪ Step-wise conversion with clear explanation.	10
Q.3	Attempt any FOUR. (All questions carry equal marks)	
A.	1. Definition of Entity – 1 M 2. Types of Entities – 2 M 3. Examples – 2 M	5
B.	Definition of Integrity Constraints – 1 M **Types of Integrity Constraints with examples – 4 M** **Entity Integrity:** Primary key cannot be NULL. Example: Student(StudentID, Name) **Referential Integrity:** Foreign key must match primary key in another table. Example: Enrollment(StudentID → Student.StudentID) **Domain Integrity:** Attribute values must be within allowed domain. Example: Age must be >0 **Key Integrity:** Unique identification of tuples. Example: EmployeeID unique in Employee table	5
C.	Definition / Purpose of Aggregate Functions – 1 M Explanation of Five Aggregate Functions – 3 M 1. COUNT(): Count number of rows 2. SUM(): Sum of values 3. AVG(): Average of values 4. MAX(): Maximum value 5. MIN(): Minimum value Examples – 1 M	5

D.	1. Definition of Distributed Database Storage – 1 M Data is stored across multiple sites. 2. Storage Methods – 3 M Fragmentation: Horizontal, Vertical, Hybrid Replication: Full or partial replication across sites Allocation: Assigning fragments to sites for efficiency 3. Examples / Explanation – 1 M Example of horizontal/vertical fragmentation or replication	5
E.	1. Definition of Log-Based Recovery – 2 M Uses logs to recover database to a consistent state after a crash. 2. Types / Steps – 2 M Undo: Rollback incomplete transactions Redo: Reapply completed transactions Steps illustrated with a simple example 3. Example – 1 M Example showing how a transaction is rolled back or redone using logs.	5
F.	Types of Keys in a Database with Examples: **1. Primary Key** o Definition: A key that uniquely identifies each record in a table. o Example: In EMPLOYEE(EmpID, EmpName, Dept), EmpID can be the primary key. **2. Candidate Key** o Definition: A minimal set of attributes that can uniquely identify a record. o Example: In EMPLOYEE(EmpID, Email), both EmpID and Email can be candidate keys. **3. Super Key** o Definition: A set of one or more attributes that can uniquely identify a record (may include extra attributes). o Example: {EmpID, EmpName} in EMPLOYEE is a super key. **4. Foreign Key** o Definition: An attribute in one table that refers to the primary key of another table. o Example: In WORKS(EmpID, DeptID), DeptID can be a foreign key referencing DEPARTMENT(DeptID). 5. **Composite Key** o Definition: A key made up of two or more attributes to uniquely identify a record. o Example: In ENROLL(StudentID, CourseID), the combination (StudentID, CourseID) forms a composite key.	5