

Fourth Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025

Database Management System

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks, L: Bloom's level, C: Course outcomes.*

Module – 1				M	L	C																																									
Q.1	a.	Define the following terms: (i) Database (ii) Schema (iii) Entity (iv) DDL (v) Degree of a relationship		05	L1	CO1																																									
	b.	Briefly explain characteristics of database approach.		05	L2	CO1																																									
	c.	List and explain advantages of using DBMS approach.		10	L2	CO1																																									
OR																																															
Q.2	a.	Define the following terms: (i) Cardinality (ii) Weak entity (iii) Program data independence (iv) DML (v) Value sets		05	L1	CO1																																									
	b.	Describe three-schema architecture. Why do we need mappings between schema levels?		05	L2	CO1																																									
	c.	Explain different types of attributes in ER model with suitable example for each.		10	L2	CO1																																									
Module – 2																																															
Q.3	a.	With suitable example, explain the entity integrity and referential integrity constraints. Why each is considered important?		05	L2	CO2																																									
	b.	Discuss equijoin and natural join with suitable example using relational algebra notation.		05	L2	CO2																																									
	c.	Given the relational tables: <table><tr><td colspan="4">Employee:</td><td colspan="2">Department:</td></tr><tr><td>EID</td><td>Name</td><td>DepID</td><td>Salary</td><td>DeptID</td><td>DeptName</td></tr><tr><td>1</td><td>Alice</td><td>10</td><td>5000</td><td>10</td><td>HR</td></tr><tr><td>2</td><td>Bob</td><td>20</td><td>6000</td><td>20</td><td>IT</td></tr><tr><td>3</td><td>Eve</td><td>20</td><td>6500</td><td>30</td><td>Sales</td></tr></table> Project <table><tr><td>PID</td><td>Project Name</td><td>DeptID</td></tr><tr><td>101</td><td>Project Alpha</td><td>10</td></tr><tr><td>102</td><td>Project Beta</td><td>20</td></tr><tr><td>103</td><td>Project Gamma</td><td>30</td></tr></table> Write relational algebra expression for the following: (i) Find the names and salaries of all employees in the 'IT' department. (ii) Find the ID's and names of employees who are in the 'IT' department and have a salary greater than 6000. (iii) Find the ID's and names of employees who are either in the 'HR' department or have a salary greater than 6000. (iv) Find the names of employees who are not in the 'IT' department (v) Find the names of employees along with their department names.	Employee:				Department:		EID	Name	DepID	Salary	DeptID	DeptName	1	Alice	10	5000	10	HR	2	Bob	20	6000	20	IT	3	Eve	20	6500	30	Sales	PID	Project Name	DeptID	101	Project Alpha	10	102	Project Beta	20	103	Project Gamma	30		10	L3
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103	Project Gamma	30																																													

1 of 3

OR

Q.4	a.	Explain any two operations that change the state of relation in a database. Provide suitable examples.	05	L2	CO2																																										
	b.	Discuss the aggregation functions and grouping in relational algebra with suitable examples.	05	L2	CO2																																										
	c.	Given the relational tables: <table><tr><th colspan="2">Student:</th></tr><tr><th>SID</th><th>Name</th></tr><tr><td>a</td><td>Alice</td></tr><tr><td>b</td><td>Bob</td></tr><tr><td>c</td><td>Carol</td></tr></table><table><tr><th colspan="2">Project:</th></tr><tr><th>PID</th><th>Project Name</th></tr><tr><td>p</td><td>Alpha</td></tr><tr><td>q</td><td>Beta</td></tr><tr><td>r</td><td>Gamma</td></tr></table> <table><tr><th colspan="2">Language:</th></tr><tr><th>LID</th><th>Language Name</th></tr><tr><td>x</td><td>Python</td></tr><tr><td>y</td><td>Java</td></tr><tr><td>z</td><td>C++</td></tr></table><table><tr><th colspan="2">Enrollment:</th></tr><tr><th>SID</th><th>PID</th></tr><tr><td>a</td><td>p</td></tr><tr><td>a</td><td>q</td></tr><tr><td>b</td><td>q</td></tr><tr><td>c</td><td>r</td></tr></table> Write relational algebra expression for the following: (i) Rename the student table to Learner and display it. (ii) Find the students (learners) who are not enrolled in any project. (iii) Find the students who are enrolled in all projects. (iv) Find the students who are not enrolled in any project. (v) Find the students who are enrolled in both the 'Alpha' and 'Beta' projects.	Student:		SID	Name	a	Alice	b	Bob	c	Carol	Project:		PID	Project Name	p	Alpha	q	Beta	r	Gamma	Language:		LID	Language Name	x	Python	y	Java	z	C++	Enrollment:		SID	PID	a	p	a	q	b	q	c	r	10	L3	CO2
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Module – 3

Q.5	a.	Explain Armstrong inference rules.	05	L2	CO4
	b.	What is the need for normalization? Explain 1NF, 2NF and 3NF with examples.	05	L2	CO4
	c.	What is functional dependency? Write an algorithm to find minimal cover for set of functional dependencies. Construct minimal cover M for set of functional dependencies which are: $E = \{B \rightarrow A, D \rightarrow A, AB \rightarrow D\}$	10	L3	CO4

OR

Q.6	a.	Explain the types of update anomalies in SQL with an example.	05	L2	CO4
	b.	Explain types of JDBC drivers.	05	L2	CO5
	c.	Consider the schema $R = ABCD$, subjected to FDs $F = \{A \rightarrow B, B \rightarrow C\}$, and the non-binary partition $D1 = \{ACD, AB, BC\}$. State whether D1 is a lossless decomposition? [give all steps in detail].	10	L3	CO4

Module – 4

Q.7	a.	Define transaction. Discuss ACID properties.	05	L2	CO5
	b.	With a neat diagram, explain transition diagram of a transaction.	05	L2	CO5
	c.	Demonstrate working of assertion and triggers in SQL with example.	10	L3	CO5

OR

Q.8	a.	Explain cursor and its properties in embedded SQL with suitable example.	05	L2	CO5
	b.	Determine if the following schedule is serializable and explain your reasoning: i) $T1 : R(X)W(X)$ $T2 : R(X)W(X)$ $T1 : COMMIT$ $T2 : COMMIT$ ii) $T1 : W(X)R(Y)$ $T2 : R(X)W(Y)$ $T1 : COMMIT$ $T2 : COMMIT$	05	L2	CO5

	c.	Consider the tables below: Sailors (<u>sid</u> : integer, sname : string, rating : integer, age : real) Boats (<u>bid</u> : integer, bname : string, color : string); Reserves (<u>sid</u> : integer, <u>bid</u> : integer, day : date) Write SQL queries for the following: (i) Write create table statement for reserves. (ii) Find all information of sailors who have reserved boat number 101. (iii) Find the names of sailors who have reserved at least one boat. (iv) Find the names of sailors who have reserved a red boat. (v) Find the average age of sailors for each rating level.	10	L3	CO5
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Module – 5

Q.9	a.	Explain the CAP theorem.	05	L2	CO6
	b.	What is NOSQL graph database? Explain Neo4j.	05	L2	CO6
	c.	Why concurrency control and recovery are needed in DBMS? Demonstrate with suitable examples types of problems that may occur when two simple transactions run concurrently.	10	L3	CO5

OR

Q.10	a.	Explain basic operations CRUD in MongoDB.	05	L2	CO6
	b.	Explain deadlock prevention protocols.	05	L2	CO5
	c.	Briefly discuss the two-phase locking techniques f_0 concurrency control.	10	L3	CO5

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