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BCS403

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:	10	L3	CO2

Employee:

EID	Name	DepID	Salary
1	Alice	10	5000
2	Bob	20	6000
3	Eve	20	6500

Department:

DeptID	DeptName
10	HR
20	IT
30	Sales

Project

PID	Project Name	DeptID
101	Project Alpha	10
102	Project Beta	20
103	Project Gamma	30

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.

		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:	10	L3	CO2

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

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.

		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 JBBC 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 : integer</u>, sname : string, rating : integer, age : real) Boats (<u>bid : integer</u>, bname : string, color : string); Reserves (<u>sid : integer</u>, <u>bid : integer</u>, 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

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 looking techniques f_0 concurrency control.	10	L3	CO5

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