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BCS403

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2024
Database Management Systems

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 database. Elaborate component modules of DBMS and their interactions.	10	L2	CO1																																				
	b.	Describe the three-schema architecture. Why do we need mappings among schema levels?	06	L2	CO1																																				
	c.	Explain the difference between logical and physical data independence.	04	L2	CO1																																				
OR																																									
Q.2	a.	Draw an ER diagram for an COMPANY database with employee, department, project as strong entities and dependent as weak entity. Specify the constraints, relationships and ratios in the ER diagram.	10	L3	CO3																																				
	b.	Define the following terms with example for each using ER notations: Entity, attribute, composite attribute, multivalued attribute, participation role.	10	L3	CO3																																				
Module – 2																																									
Q.3	a.	Discuss the update operations and dealing with constraint violations with suitable examples.	08	L2	CO2																																				
	b.	Illustrate the relational algebra operators with examples for select and project operation.	06	L2	CO2																																				
	c.	Discuss the characteristics of relations that make them different from ordinary table and files.	06	L2	CO2																																				
OR																																									
Q.4	a.	Perform (i) Student \cup instructor (ii) Student \cap Instructor (iii) Student – Instructor (iv) Instructor – Student on the following tables: <table><tr><th colspan="2">Student</th><th colspan="2">Instructor</th></tr><tr><td>Fname</td><td>Lname</td><td>Fname</td><td>Lname</td></tr><tr><td>Susan</td><td>Yao</td><td>John</td><td>Smith</td></tr><tr><td>Ramesh</td><td>Shah</td><td>Ricardo</td><td>Browne</td></tr><tr><td>Johnny</td><td>Kohler</td><td>Susan</td><td>Mao</td></tr><tr><td>Barbara</td><td>Jones</td><td>Francis</td><td>Johnson</td></tr><tr><td>Amy</td><td>Ford</td><td>Ramesh</td><td>Shah</td></tr><tr><td>Jimmy</td><td>Wang</td><td></td><td></td></tr><tr><td>Ernest</td><td>Gilbert</td><td></td><td></td></tr></table>	Student		Instructor		Fname	Lname	Fname	Lname	Susan	Yao	John	Smith	Ramesh	Shah	Ricardo	Browne	Johnny	Kohler	Susan	Mao	Barbara	Jones	Francis	Johnson	Amy	Ford	Ramesh	Shah	Jimmy	Wang			Ernest	Gilbert			04	L3	CO2
Student		Instructor																																							
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	b.	Consider the following relational database schema and write the queries in relational algebra expressions: EMP(<u>Eno</u> , Ename, Salary, Address, Phone, DNo) DEPT(<u>DNo</u> , Dname, DLoc, MgrEno) DEPENDENT(<u>Eno</u> , <u>Dep_Name</u> , Drelation, Dage) (i) List all the employees who reside in 'Belagavi'. (ii) List all the employees who earn salary between 30000 and 40000 (iii) List all the employees who work for the 'Sales' department (iv) List all the employees who have at least one daughter (v) List the department names along with the names of the managers	10	L3	CO2																																				

c.	Consider the two tables T ₁ and T ₂ shown below: <div><div><div>T₁</div><table><tr><td>P</td><td>Q</td><td>R</td></tr><tr><td>10</td><td>a</td><td>5</td></tr><tr><td>15</td><td>b</td><td>8</td></tr><tr><td>25</td><td>a</td><td>6</td></tr></table></div><div><div>T₂</div><table><tr><td>A</td><td>B</td><td>C</td></tr><tr><td>10</td><td>b</td><td>6</td></tr><tr><td>25</td><td>c</td><td>3</td></tr><tr><td>10</td><td>b</td><td>5</td></tr></table></div></div> Show the results of the following operations: (i) T ₁ ⋈ _{T₁.P=T₂.A} T ₂ (ii) T ₁ ⋈ _{T₁.Q=T₂.B} T ₂ (iii) T ₁ ⋈ _(T₁.P=T₂.A AND T₁.R=T₂.C) T ₂	P	Q	R	10	a	5	15	b	8	25	a	6	A	B	C	10	b	6	25	c	3	10	b	5	06	L3	CO2
P	Q	R																										
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A	B	C																										
10	b	6																										
25	c	3																										
10	b	5																										
Module – 3																												
Q.5	a.	Discuss the informal design guidelines for relation schema design.	08	L2	CO4																							
	b.	Define 1NF, 2NF, and 3NF with examples.	06	L2	CO4																							
	c.	Write the syntax for INSERT, UPDATE and DELETE statements in SQL and explain with suitable examples.	06	L2	CO3																							
OR																												
Q.6	a.	Discuss insertion, deletion and modification anomalies. Why are they considered bad? Illustrate with examples.	10	L2	CO3																							
	b.	Illustrate the following with suitable examples: (i) Datatypes in SQL (ii) Substring Pattern Matching in SQL.	10	L2	CO3																							
Module – 4																												
Q.7	a.	Consider the following relations: Student(<u>Snum</u> , Sname, Branch, level, age) Class(<u>Cname</u> , meet_at, room, fid) Enrolled(<u>Snum</u> , <u>Cname</u>) Faculty(<u>fid</u> , fname, deptid) Write the following queries in SQL. No duplicates should be printed in any of the answers. (i) Find the names of all Juniors (level = JR) who are enrolled in a class taught by I. Teach. (ii) Find the names of all classes that either meet in room R128 or have five or more students enrolled. (iii) For all levels except JR, print the level and the average age of students for that level. (iv) For each faculty member that has taught classes only in room R128, print the faculty member's name and the total number of classes she or he has taught. (v) Find the names of students not enrolled in any class.	10	L3	CO3																							
	b.	What do you understand by correlated Nested Queries in SQL? Explain with suitable example.	04	L2	CO3																							
	c.	Discuss the ACID properties of a database transaction.	06	L2	CO4																							
OR																												
Q.8	a.	What are the views in SQL? Explain with examples.	04	L3	CO5																							
	b.	In SQL, write the usage of GROUP BY and HAVING clauses with suitable examples.	06	L2	CO3																							
	c.	Discuss the types of problems that may encounter with transactions that run concurrently.	10	L2	CO5																							

Module – 5					
Q.9	a.	What is the two phase locking protocol? How does it Guarantee serializability.	06	L2	CO5
	b.	Describe the wait-die and wound-wait protocols for deadlock prevention.	08	L2	CO5
	c.	List and explain the four major categories of NOSQL system.	06	L2	CO3
OR					
Q.10	a.	What is Multiple Granularity locking? How is it implemented using intension locks? Explain.	10	L2	CO5
	b.	Discuss the following MongoDB CRUD operations with their formats: (i) Insert (ii) Delete (iii) Read	06	L2	CO4
	c.	Briefly discuss about Neo4j data model.	04	L2	CO4
