

CBCS SCHEME - Make-Up Exam

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BCS403

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2025 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.*

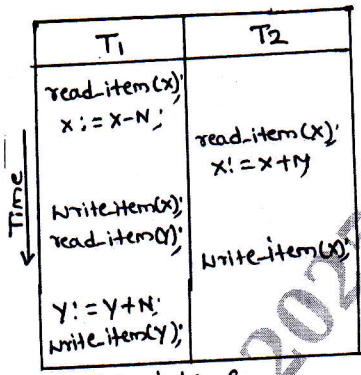
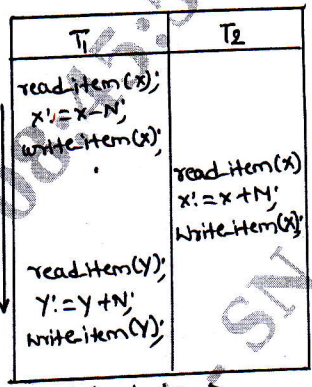
Module – 1			M	L	C
Q.1	a.	Define DBMS. Discuss the main characteristics of the database approach and how does it differ from traditional file system.	10	L2	CO1
	b.	Discuss the different types of user-friendly interfaces and the types of users who typically use each.	10	L2	CO1
OR					
Q.2	a.	Explain three-schema architecture. Why do we need mappings between schema levels?	10	L2	CO1
	b.	Construct an ER diagram for BANK database schema with atleast five entity types. Also specify primary key and structural constructs.	10	L3	CO1
Module – 2					
Q.3	a.	Explain the characteristics of relations with an example for each.	8	L2	CO1
	b.	Explain entity integrity constraint and referential integrity constraint with an example for each.	8	L2	CO1
	c.	Explain the following unary operations with syntax and example: i) SELECT ii) PROJECT	4	L2	CO1
OR					
Q.4	a.	Explain ER to relational mapping algorithm with suitable example for each step.	10	L2	CO1
	b.	Consider the following schema: EMP (Fname, Lname, ssn, Dno, Salary) DEPT (Dname, Dnum, Mgr_ssn) D_LOC (Dno, LOC) PROJECT (Pname, Pno, Dno, PLOC) WORKS_ON (Essn, Pno, Hours) Construct the query in relational algebra for the following: i) Display the ssn, firstname and last name of the employee working for department no 5. ii) Retrieve the location of the 'Accounts' department. iii) Select the tuples for all employees who either work in department 4 and make over \$25000 per year , or work in department 5 and make over \$30000. iv) Retrieve the names of the project controlled by department no 5. v) Retrieve the names of employees working on project no 8.	5	L3	CO1

c.	Consider the two tables T_1 and T_2	5	L3	CO1																							
	T_1 <table border="1"><thead><tr><th>P</th><th>Q</th><th>R</th></tr></thead><tbody><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></tbody></table> T_2 <table border="1"><thead><tr><th>A</th><th>B</th><th>C</th></tr></thead><tbody><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></tbody></table> Identify the results of the following operations: i) $\sigma_{Q=a}(T_1)$ ii) $\pi_{A,C}(T_2)$ iii) $T_1 \bowtie_{T_1.P=T_2.A} T_2$ iv) $T_1 \bowtie_{T_1.Q=T_2.B} T_2$ v) $T_1 \cup T_2$.	P	Q	R	10	a	5	15	b	8	25	a	6	A	B	C	10	b	6	25	c	3	10	b	5		
P	Q	R																									
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25	c	3																									
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Module – 3

Q.5	a. Make use of the relation schema in Fig.Q.5(a) to illustrate insertion, deletion and modification anomalies. EMP_DEPT <table><tr><td>Ename</td><td>ssn</td><td>Bdate</td><td>Address</td><td>Dname</td><td>Dno</td><td>Mgr ssn</td></tr></table> Fig.Q.5(a)	Ename	ssn	Bdate	Address	Dname	Dno	Mgr ssn	8	L3	CO4																		
Ename	ssn	Bdate	Address	Dname	Dno	Mgr ssn																							
	b. Consider the relation schema LOTS which describes parcels of land for sale in various counties of a state. Suppose that there two candidate keys: Property Id and {County_name, Lot}; that is lot numbers are unique only within each county, but property_Id numbers are unique across counties for the entire state. LOTS (Property_Id, county_name, Lot, Area, Price, Tax_rate) The following FDs hold i) FD1 : Property_Id → (County_name, Lot, Area, Price, Tax_rate) ii) FD2 : {County_name, Lot} → {Property_Id, Area, Price, Tax_rate} iii) FD3 : County_name → Tax_rate iv) FD4 : Area → Price Construct a relational schema for this database application that are each in 3NF.	7	L3	CO4																									
	c. For the given relation R(A, B, C, D, E) and its instance (Fig.Q.5(c)), check whether the FDs given hold or not. Give reasons i) A → B ii) B → C iii) D → E iv) CD → E v) AB → E R <table><tr><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td></tr><tr><td>a₁</td><td>b₁</td><td>c₁</td><td>d₁</td><td>e₁</td></tr><tr><td>a₁</td><td>b₂</td><td>c₁</td><td>d₁</td><td>e₁</td></tr><tr><td>a₂</td><td>b₂</td><td>c₁</td><td>d₂</td><td>e₃</td></tr><tr><td>a₂</td><td>b₃</td><td>c₃</td><td>d₂</td><td>e₂</td></tr></table> Fig.Q.5(c)	A	B	C	D	E	a ₁	b ₁	c ₁	d ₁	e ₁	a ₁	b ₂	c ₁	d ₁	e ₁	a ₂	b ₂	c ₁	d ₂	e ₃	a ₂	b ₃	c ₃	d ₂	e ₂	5	L3	CO4
A	B	C	D	E																									
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a ₂	b ₃	c ₃	d ₂	e ₂																									

OR					
Q.6	a.	Illustrate the structure of SQL retrieval query with syntax and example.	8	L2	CO3
	b.	Consider the following schema: Student (<u>Usn</u> , Name, Age, Branch) Course (<u>Coursecode</u> , <u>Coursename</u> , Credits) Enroll (Usn, Coursecode) Grade (Usn, Coursecode, Grade) Construct the SQL statements to perform the following operations: i) Creating the tables by specifying the primary key and foreign key constraints. ii) Insert a new student <'24CS001', 'Amith', 19, 'CSE'> iii) Change the credit of the course having coursecode 22CS402 from 2 to 3. iv) Delete a student record from the grade table having USN '22CS010'.	7	L3	CO3
	c.	Illustrate the following SQL commands with syntax and example for each : i) CREATE ii) INSERT iii) DELETE iv) UPDATE v) ALTER	5	L2	CO3
Module – 4					
Q.7	a.	Illustrate creation of triggers and assertions with syntax and example for each.	10	L2	CO3
	b.	Consider the following schema for a COMPANY database Employee (Fname, Lname, <u>ssn</u> , Address, Superssn, salary Dno) Department (Dname, <u>Dnumber</u> , Mgr_ssn, Mgr_stdtd) Department_Locs (Dnumber, Dlocation) Project (Pname, <u>Pnumber</u> , Plocation, Dnum) Works_On (Essn, Pno, Hrs) Dependent (Essn, Dependent_name, Sex, Bdate, Relationship) Construct the SQL query for the following: i) List the names of managers who have atleast one dependent. . ii) Retrieve the list of employees and the projects they are working on, ordered by department and within each department, ordered alphabetically by lastname, firstname. iii) For each project, retrieve the project number, the project name and the number of employees who work on that project. iv) For each project on which more than two employees work, retrieve the project number, the project name, and the number of employees who work on the project. v) For each project, retrieve the project number, the project name, and the numbers of employees from department 4 who work on the project.	10	L3	CO3
OR					
Q.8	a.	Discuss ACID properties. With a neat diagram explain the different states a transaction goes through during its execution.	10	L2	CO1
3 of 4					

	b. Write an algorithm to test conflict serializability of a schedule S. Apply the same to test the serializability of the schedule C and D.  Schedule C  Schedule D	10	L3	CO1
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Module - 5

Q.9	a. Illustrate with an algorithm, the shared/exclusive locks.	10	L2	CO1
	b. Discuss the problems that can occur when concurrent transactions are executed.	10	L2	CO1
OR				
Q.10	a. Explain the characteristics of NOSQL systems.	10	L2	CO6
	b. Illustrate MongoDB CRUD operations with an example for each.	10	L2	CO6
