Thapar Institute of Engineering and Technology, Patiala

Department of Computer Science and Engineering

END SEMESTER EXAMINATION

Course Code: UCT 402	Course Name: Database Management Systems
May 21, 2024	Tuesday, 9.00 – 12.00
Time: 3 hours, M. Marks: 35	Name of Faculty: Dr. Rupali Bhardwaj

Note: Attempt any five questions.

Q1 a.	What is data abstraction? How the data abstraction achieved in DBMS? Explain with example.	3.5
Q1 b.	Which relational algebra operations require the participating tables to be union-compatible? Give the Reason in detail.	3.5
Q2 a.	Consider relation scheme, R={A,B,C,D,E} with the set of functional dependecies- $A \rightarrow B$, $BC \rightarrow E$, $ED \rightarrow A$ i. Determine key for the relation. ii. Normalize the relation up to BCNF normal form and justify your answer. iii. Determine whether the decomposition in BCNF is lossy or lossless. iv. Determine the dependencies in BCNF are preserved or not.	0.5+1.5+ 1.5+1.5
Q2 b.	Describe Armstrong's axioms in detail. What is the role of these rules in database	02
Q3 a.	Consider the schema: Suppliers (sid, sname, address), Parts (pid, pname, color) Catalog (sid, pid, cost). Write the following queries in relational algebra- i. Find name of suppliers who supply some blue parts. ii. Find the sid of suppliers who supply some red or green parts. iii. Find the sid of suppliers who supply some red part or are at Patiala. iv. Find the sid of suppliers who supply every part. v. Find the sid of suppliers who supply every red or green part.	05
Q3 b.	Given a schedule S for transactions T1 and T2 with set of read and write operations, S: R1(X) R2(X) R2(Y) W2(Y) R1(Y) W1(X). Identify, whether given schedule is equivalent to serial schedule or not?	02
Q4 a.	Given the relation schemas R= (A, B, C) and S= (D, E, F) and relation instances r (R) and s(S). Give an expression in tuple relational calculus that is equivalent to each of following- i. $\pi_A (r)$ ii. $\sigma_{A>20} (r)$	04 P.T.O.

	iii. $r \times s$ iv. $\pi_{A,F}(\sigma_C = \square_D(r \times s))$	
Q4 b.	List ACID properties of transaction in brief. What is the importance of log?	03
Q5 a.	Which of the following schedules are conflicts serializable? For each serializable schedule find the equivalent schedule: S_1: $r_1(X); r_3(X); w_3(X); w_1(X); r_2(X)$ S_2: $r_3(X); r_2(X); w_3(X); r_1(X); w_1(X)$ S_3: $r_1(X); r_2(X); r_3(Y); w_1(X); r_2(Z); r_2(Y); w_2(Y)$	04
Q5 b.	Describe major problems associated with concurrent processing with examples. What is the role of locks in avoiding these problems?	03
Q6 a.	Consider the following relational database: Employee (person-name, street, city), Works (person-name, company-name, salary), Company (company-name, city), Manages (person-name, manger-name). Write the following queries in SQL- i. Find name of all employees who work for SBI bank. ii. Find name of all employees who live in same city and on same street as do their manager. iii. Find name, street, city of all employees who work for SBI bank and earn more than Rs 8000 per annum. iv. Find name of all employees earn more than every employee of Kotak bank. v. Find name of all employees in this database who live in same city as the company for which they work.	05
Q6 b.	Explain state diagram of transaction in detail. Explain recoverable and cascadeless schedules with example.	02