

JK Lakshmipat University Jaipur
INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination, December 2023

B. Tech. (CSE), Semester III, 2023-24

Roll No.....

CS1133: Database Management Systems

Time: 2 hours

Max. Marks: 30

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Mention all the assumptions for your answers clearly.

Q.1	Consider the schema for a Research and Development Database: SCIENTIST (<u>SID</u>, Name, Grade, Salary) RESEARCH (<u>Rcode</u>, Area, Description, Status) FACILITY (<u>FID</u>, Facility Name, Facility Address) USAGE (<u>SID</u>, <u>Rcode</u>, <u>FID</u>) Using the schema provided above, write queries using SQL for the following: a. List the names of scientists who work in research area 'DBMS' b. Get the names of scientists who earn more than the average salary c. Write two separate SQL queries: a. For those projects where a usage has been recorded, update the status of research projects as 'ONGOING' b. For those projects where a usage has never been recorded, update the status of research projects as 'SHELVED' d. A new column called building number is to be added in the FACILITY table. Alter the schema to reflect this change. e. Delete the data of research code 'R11'.	(6) (LO4)
Q.2.1	a. Consider a relation R(A,B,C,D E) the following sets of Functional Dependencies (FDs). X: {A->BC, AB->D, C->F, C->E} Y: {AC->F, CD ->EF, A->BC, B->D} Are they equivalent? Show each step b. Consider the attribute set R(A,B,C,D,E,F). For the FD set F = { A->BC, AB->C, C->DF, CD->F }, What is the minimal /canonical cover?	2+2 (LO3)

Q.2.2	Consider a Relation R (A, B, C, D), and the set of FDs F: {AB → C, AB → D, C → A, D → B} Answer the following: a. Identify the candidate keys b. Identify the best normal form it satisfies. Show the steps for each normal form. c. If it is not in BCNF, decompose it into a set of BCNF relations. d. Is the decomposition lossless and dependency preserving?	1+1+1 +1=4 (LO4)																																				
Q.3.1	Consider the following schedule. There are three resources X, Y and Z and three transactions T1,T2 and T3 . T1 : Lock shared(X) T2 : Lock shared(Z) T1 : Lock shared(Z) T3 : Lock shared(X) T3 : Lock shared(Y) T1 : Lock exclusive(X) T1: Unlock X T3 : Lock exclusive(Y) T3: Unlock Y T2 : Lock shared(Y) T2 : Lock exclusive(Z) a. Draw the precedence graph with an explanation for each edge. b. Is the schedule serializable? If so, what is the equivalent serial schedule? OR a. What are the rules for a precedence graph to check serializability? b. Once the graph is formed, how do we arrive at the correct serial schedule?	2+2 (LO6) 2+2 (LO6)																																				
Q.3.2	Consider the following schedule with three transactions 1,2,3 and three resources X, Y and Z. You can either consider the schedule on the right OR the left <table><tr><td></td><td>T1</td><td>T2</td><td>T3</td></tr><tr><td>Read₁(X)</td><td>Read X</td><td></td><td></td></tr><tr><td>Write₁(X)</td><td>Write X</td><td></td><td></td></tr><tr><td>Read₂(Z)</td><td></td><td>Read Z</td><td></td></tr><tr><td>Read₃(X)</td><td></td><td></td><td>Read X</td></tr><tr><td>Read₃(Y)</td><td></td><td></td><td>Read Y</td></tr><tr><td>Write₂(Z)</td><td></td><td>Write Z</td><td></td></tr><tr><td>Write₃(Y)</td><td></td><td></td><td>Write Y</td></tr><tr><td>Write₂(Y)</td><td></td><td>Write Y</td><td></td></tr></table> Perform conflict serialization on either schedule clearly showing the swaps in each step. Is the schedule conflict serializable? OR a. In time stamp-based concurrency protocol, what are the rules when a transaction T wants to READ and WRITE a resource O? b. How is view equivalence and view serializability proven? Mention the three rules clearly.		T1	T2	T3	Read ₁ (X)	Read X			Write ₁ (X)	Write X			Read ₂ (Z)		Read Z		Read ₃ (X)			Read X	Read ₃ (Y)			Read Y	Write ₂ (Z)		Write Z		Write ₃ (Y)			Write Y	Write ₂ (Y)		Write Y		4 (LO6) 2+2 (LO6)
	T1	T2	T3																																			
Read ₁ (X)	Read X																																					
Write ₁ (X)	Write X																																					
Read ₂ (Z)		Read Z																																				
Read ₃ (X)			Read X																																			
Read ₃ (Y)			Read Y																																			
Write ₂ (Z)		Write Z																																				
Write ₃ (Y)			Write Y																																			
Write ₂ (Y)		Write Y																																				

Q.4	Given the following log file in the format (read/write, Transaction, resource, before image, after image). There are three transactions and three resources. (start, T4); (write, T4, C, 1, 6); (commit, T4) (start, T1); (write, T1, A, 6, 7); (start, T2); (write, T2, B, 1, 9); (start, T3); (write, T3, B, 9, 2); Perform UNDO/REDO of recovery. Clearly stating: a. Which transactions will be under go UNDO and which REDO? b. What will be the final values of resources A, B and C? OR a. Does 2PL locking protocol prevent a Deadlock situation? Consider the schedule in Q3.1. Is there a deadlock situation? b. How can timestamps of a transaction be used for Deadlock prevention?	2+2 (LO6) 2+2 (LO5)
Q.5	Answer the following questions: 1.1. TRC is a _____ (procedural/non-procedural) language 1.2. Write the TRC equivalent of the following SQL: a. SELECT E.NAME, E.CITY FROM EMPLOYEE WHERE CITY = 'JAIPUR' b. SELECT E.NAME FROM EMPLOYEE E INNER JOIN DEPARTMENT D ON E.DEPT_ID = D. DEPT_ID WHERE DEPT_NAME ='CSE' 1.3. Given the following transaction, Begin Tran T1 Print 'in T1' Arrow 1 → Select 'in T1' Arrow 2 → Arrow 3 → Commit Tran t1 At the position of the arrows 1, 2 and 3, what is the state the transaction T1 is in? a) Active, Active, Committed respectively b) Partially committed, Committed, Committed respectively c) Active, Active, exit system respectively d) Active, Partially committed, Committed respectively	4 (LO 3,4,5)

