

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION - 2023

B.Tech-III Semester (CSE &IT)

COURSE CODE (CREDITS): 18B11CI313 (3)

MAX. MARKS: 35

COURSE NAME: DATABASE MANAGEMENT SYSTEMS

MAX. TIME: 2 Hrs.

COURSE INSTRUCTORS: Prof. P.K. Gupta, Dr. Pardeep Kumar, Dr. Ekta Gandotra, Dr. Amit Kumar, Dr. Nishant Sharma

Note: (a) All questions are compulsory and attempt all questions sequentially.
 (b) Marks are indicated against each question in square brackets.
 (c) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

Q1. Consider the following two transactions:

[CO5] [3+3]

T₃₁: read(A);
 read(B);
 if A = 0 then B := B+1;
 write(B).
 T₃₂: read(B);
 read(A);
 if B = 0 then A := A+1;
 write(A).

Answer the following:

- Add lock and unlock instructions to transactions T₃₁ and T₃₂, so that they observe the two-phase locking protocol.
- Can the execution of these transactions result in a deadlock? *Explain why or why not?*

Q2. Consider the following two transactions and schedule (time goes left to right). Is this schedule conflict-serializable? *Explain why or why not.* Here, r_i[X] and w_i[X] denote read and write operations on a data element X by a Transaction T_i.

[CO6] [5]

	1	2	3	4	5	6	7	8
T ₀	r ₀ [A]	w ₀ [A]				r ₀ [B]	w ₀ [B]	c ₀
T ₁			r ₁ [A]	r ₁ [B]	c ₁			

Q3. Consider the following proposed rule for functional dependencies: If $\alpha \rightarrow \beta$ and $\gamma \rightarrow \beta$, then $\alpha \rightarrow \gamma$. Prove that this rule is not sound by showing a relation r that satisfies $\alpha \rightarrow \beta$ and $\gamma \rightarrow \beta$, but does not satisfy $\alpha \rightarrow \gamma$.

[CO4] [4]

Q4. What are the tradeoffs between having fewer disks versus more disks in terms of cost, reliability, and performance during failure in RAID 5? [CO7] [3]

Q5. Suppose that we have the following four tuples in a relation S with three attributes ABC : (1,2,3), (4,2,3), (5,3,3), (5,3,4). Which of the following functional (\rightarrow) and multivalued ($\rightarrow\rightarrow$) dependencies can you infer does *not* hold over relation S ? Justify your answer. [CO4] [4]

- a) $A \rightarrow B$
- b) $BC \rightarrow\rightarrow A$
- c) $B \rightarrow\rightarrow C$
- d) $BC \rightarrow A$

Q6. Create a B tree of order 4 for the following sequence of keys. Show its structure after every insertion. [CO6] [4]

1, 5, 6, 2, 8, 12, 14, 15, 20, 7, 10

Q7. Consider the following two schedules of actions on the data items A, B, C and D, listed in the order it is submitted to the DBMS (S is a shared lock, X is an exclusive lock):

S1: T4:X(A), T3:S(C), T1:S(B), T2:X(B), T3:X(C), T2:X(A), T1:S(C), T4:S(B)

S2: T1:X(A), T3:S(D), T3: S(A), T4:X(C), T2:S(B), T4:X(A), T2:X(C), T1:X(B), T4:X(D)

For both the sequences S1 and S2, answer the following: [CO6] [3+3]

- a) Mention for each request whether the request is granted or blocked by the lock manager.
- b) Show the waits-for graph and indicate whether there will be a deadlock or not at the end of each sequence.

Q8. Find out whether the following schedules are recoverable, cascadeless, and strict schedule or not. Justify your answer. [CO6] [3]

- a) S_1 : $r_1(X)$; $w_1(X)$; $r_2(X)$; $r_1(Y)$; $w_2(X)$; c_2 ; a_1 ;
- b) S_2 : $r_1(X)$; $w_1(X)$; $r_2(X)$; $r_1(Y)$; $w_2(X)$; $w_1(Y)$; a_1 ; a_2 ;
- c) S_3 : $w_1(X, 5)$; $w_2(X, 8)$; a_1 ;