

01/12/2017

(E)

G-I

Dr. Aditi Zang

Roll No.

158

National Institute of Technology, Hamirpur
Department of Computer Science and Engineering
(End Semester Examination, December 2017)

Course: B.Tech
 Subject: DBMS
 Time : 3hrs

Semester/Year : 5th
 Subject Code : CSD-313
 Total Marks: 60

Instructions for candidates:

1. Mobile phones, Tablets, Programmable Calculators are not allowed in the examination hall.
2. Wherever necessary try to validate your answer with example.
3. Attempt all questions.

Question 1: Answer the following questions

[2×6=12]

- a. What is the difference between homogeneous and heterogeneous distributed database systems?
- b. Consider the relational schema R(A, B, C) with following functional dependencies:
 $AB \rightarrow C$
 $C \rightarrow A$
 Show that the schema R is in 3NF but not in BCNF.
- c. What is the difference between a primary index and a secondary index?
- d. In designing a relational database, why might we choose a non-BCNF design?
- e. Draw the structure of file organization used to store variable length records.
- f. Explain the concept of multilevel indices.

Question 2: Answer the following questions

[3×4=12]

- a. Why a rolled back transaction under timestamp ordering protocol is assigned a new timestamp? Also explain why time stamp ordering protocol is free from deadlock.
- b. Stable storage cannot be implemented.
 1. Explain why it cannot be.
 2. Explain how database systems deal with this problem.
- c. Find out and explain whether the given schedule S is Recoverable or Cascadeless schedule or not.

T1	T2	T3	T4
	Read(X)		
		Write(X)	
		Commit	
Write(X)			
Commit			
	Write(Y)		
	Read(Z)		
	Commit		
			Read(X)
			Read(Y)
			Commit

- d. The keys 12, 18, 13, 2, 3, 23, 11, 20, 5 and 15 are inserted into an initially empty hash table of length 10 using open addressing with hash function $h(k) = k \bmod 10$ and linear probing. What will be the resulting hash table and total no of collisions resulted after inserting given values?

Question 3: Answer the following questions

[4×3=12]

- a. Compare the deferred- and immediate-modification versions of the log-based recovery scheme with the help of an example.

- b. Consider two transactions T1 and T2 and four schedules S1, S2, S3 and S4 of T1 and T2:

T1: R1(X) W1(X) W1(Y)

T2: R2(X) R2(Y) W2(Y)

S1: R1(X) R2(X) R2(Y) W1(X) W1(Y) W2(Y);

S2: R1(X) R2(X) R2(Y) W1(X) W2(Y) W1(Y);

S3: R1(X) W1(X) R2(X) W1(Y) R2(Y) W2(Y);

S4: R2(X) R2(Y) R1(X) W1(X) W1(Y) W2(Y);

Which of the above schedules is/are conflict serializable? Also find out the serializability order of conflict serializable schedules.

- c. For each of the three partitioning techniques, namely round-robin, hash partitioning, and range partitioning, give an example of a query for which that partitioning technique would provide the fastest response in parallel databases.

[4×6=24]

Question 4: Answer the following questions

- a. Consider the following set of key values:

(0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10)

Construct the B⁺-tree for the cases where no of pointer that will fit in one node are:

1. Four
2. Five

After constructing B⁺-tree, perform following series of operations

1. Delete 6
2. Delete 9
3. Delete 4

- b. Let the following relation schemas be given:

R = (A, B, C)

S = (D, E, F, A)

Let relations r(R) and s(S) be given. Give an expression in SQL that is equivalent to each of the following queries.

1. $\Pi_A(r)$
2. $\sigma_{B=17}(r)$
3. $\Pi_A(r) \bowtie \Pi_A(s)$
4. $\Pi_{A,F}(\sigma_{C=D}(r \times s))$

- c. Show that the two-phase locking protocol ensures conflict serializability and that transactions can be serialized according to their lock points.

- d. Let R (A, B, C, D) be a relational schema with following functional dependencies:

$A \rightarrow B$, $B \rightarrow C$, $C \rightarrow D$ and $D \rightarrow B$

1. Find out the highest normal form of given relation R.
2. Find out whether the decomposition of R into (A, B), (B, C) and (B, D) is dependency preserving and lossless join or not?