KONGU ENGINEERING COLLEGE, PERUNDURAI 638 060
CONTINUOUS ASSESSMENT TEST - III
Regulations 2020

Month and Year :June 2023	Roll Number :
Programme :B.Tech Branch :IT Semester : IV	Date : Time :
Course Code :20ITT42 Course Name :Database Management Systems	Duration : 1 ½ Hours Max. Marks: 50

PART – A (10×2 = 20 Marks)

ANSWER ALL THE QUESTIONS

1. Differentiate between dense and sparse index. [CO4,K2]

In a dense index, an index entry appears for every search-key value in the file. In a dense clustering index, the index record contains the search-key value and a pointer to the first data record with that search-key value. The rest of the records with the same search-key value would be stored sequentially after the first record, since, because the index is a clustering one, records are sorted on the same search key.

In a sparse index, an index entry appears for only some of the search key values. Sparse indices can be used only if the relation is stored in sorted order of the search key; that is, if the index is a clustering index.

2. Test the following Schedule for view serializability **R1(A), R2(B), W3(A), W1(A), W2(B), R1(C).** [CO4,K3]

It contain blind writes W3(A). So, it is view serializable.

3. Draw the necessary diagram to define the steps in query processing. [CO4,K2]

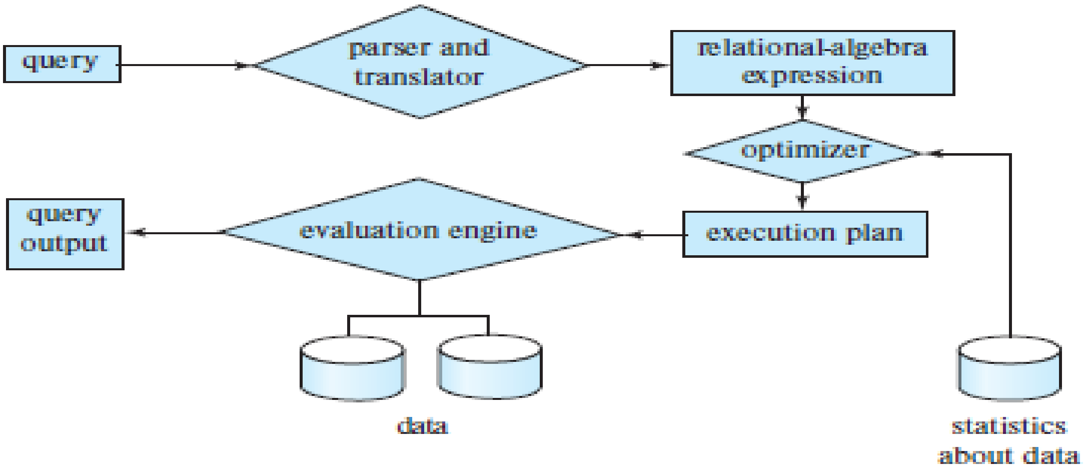


Figure 15.1 Steps in query processing.

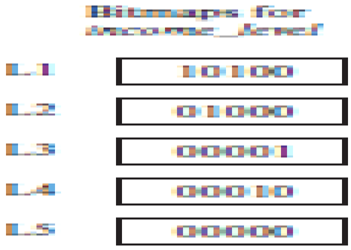
1. Parsing and translation 2. Optimization 3. Evaluation.

4. List the transaction states. [CO4,K1]

Active, Partially committed , Committed, failed and aborted

5. Construct Bitmaps for gender and income_level for the following Instructor relation. [CO4,K3]

Bitmaps for Gender

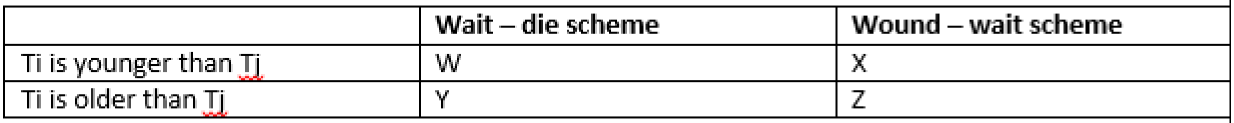


Bitmaps for income_level

L1	10100
L2	01000
L3	00001
L4	00010
L5	00000

Male: 10010
Female: 01101

6. Assume that Ti requests a lock held by Tj. The following table summarizes the actions taken for wait-die and wound-wait scheme: [CO5,K3]

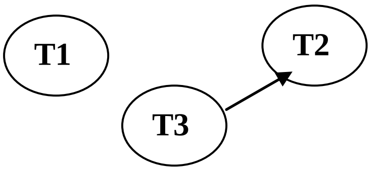


	Wait – die scheme	Wound – wait scheme
Ti is younger than Tj	W	X
Ti is older than Tj	Y	Z

Fill correct status of Ti and Tj at W, Y, X, and Z respectively.

Ti dies, Ti waits, Ti waits, and Tj aborts respectively.

7. Consider following schedule S with operations R1(A), W2(B), W1(A), R3(C), W2(C) locking protocol is used to ensure concurrency. Show wait-for graph for schedule S. [CO5,K3]



8. Apply Timestamp-Ordering Protocol for the given problem and identify the transactions to be aborted. Also, apply Thomas rule to identify the ignore writes. [CO5,K3]

Assume that initially:

R-TS(A) = W-TS(A) = 0
R-TS(B) = W-TS(B) = 0
R-TS(C) = W-TS(C) = 0 ; Assume TS(T_1) = 1, TS(T_2) = 2 and TS(T_3) = 3

T1	T2	T3
R(A)		
W(A)		
	W(A)	
		R(C)
R(C)		
	W(B)	
		W(C)

No transaction is aborted if Timestamp-Ordering Protocol is applied. So, there is no need for Thomas rule.

9. Construct log record for the following Transaction T_1. [CO5,K3]

Instruction	Writes
R(A)	A=100
A=A-10	
W(A)	A=90
R(B)	B=50
B=B+10	
W(B)	B=60

<T1 Start>

<T1, A,100,90>

<T1, B,50,60>

<T1 Commit>

10. Consider the following transaction schedules having checkpoints. Identify the transactions for redone and Undone . [CO5,K3]

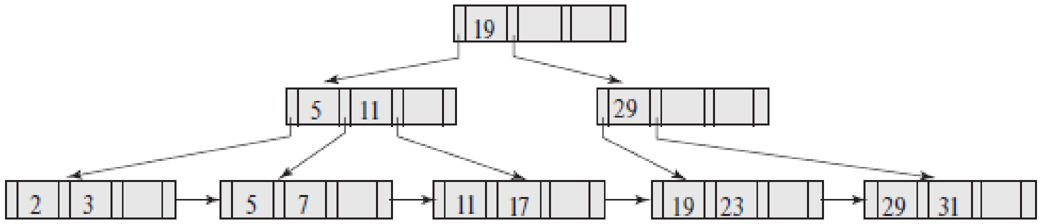
T1; T2 can be ignored, T3 must be redone, T4; T5 must be undone and restarted.

PART – B (3 × 10 = 30 Marks)

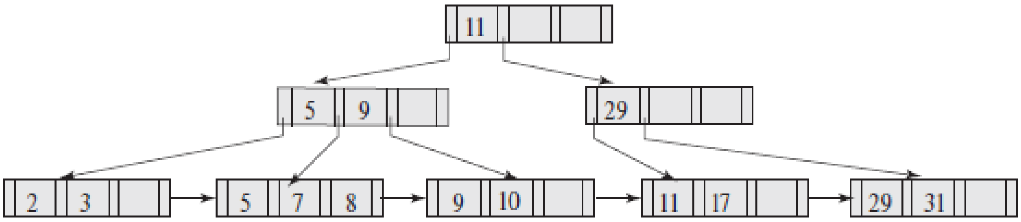
ANSWER ANY THREE QUESTIONS

11. Construct a B+-tree for the following set of key values :(2, 3, 5, 7, 11, 17, 19, 23, 29 and 31). Assume that the tree is initially empty and values are added in ascending order. Construct B+-trees for the cases where the number of pointers that will fit in one node is Four. Also, show the form of the tree after each of the following series of operations: (10) [CO4,K3]

a. Insert 9. b. Insert 10. c. Insert 8. d. Delete 23. e. Delete 19.

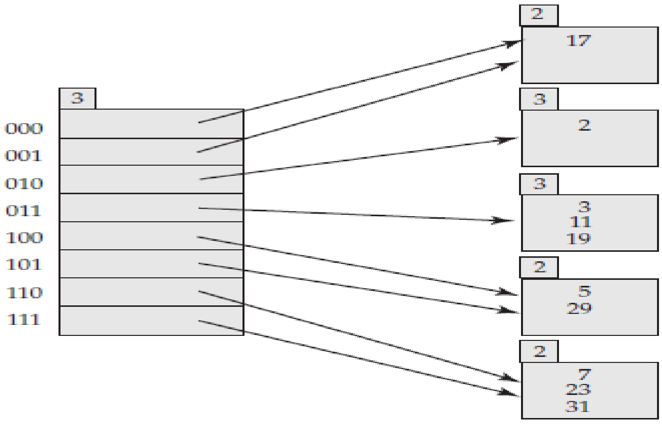


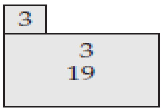
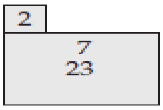
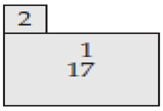
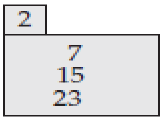
After, Insert 9, Insert 10, Insert 8, Delete 23 and Delete 19.

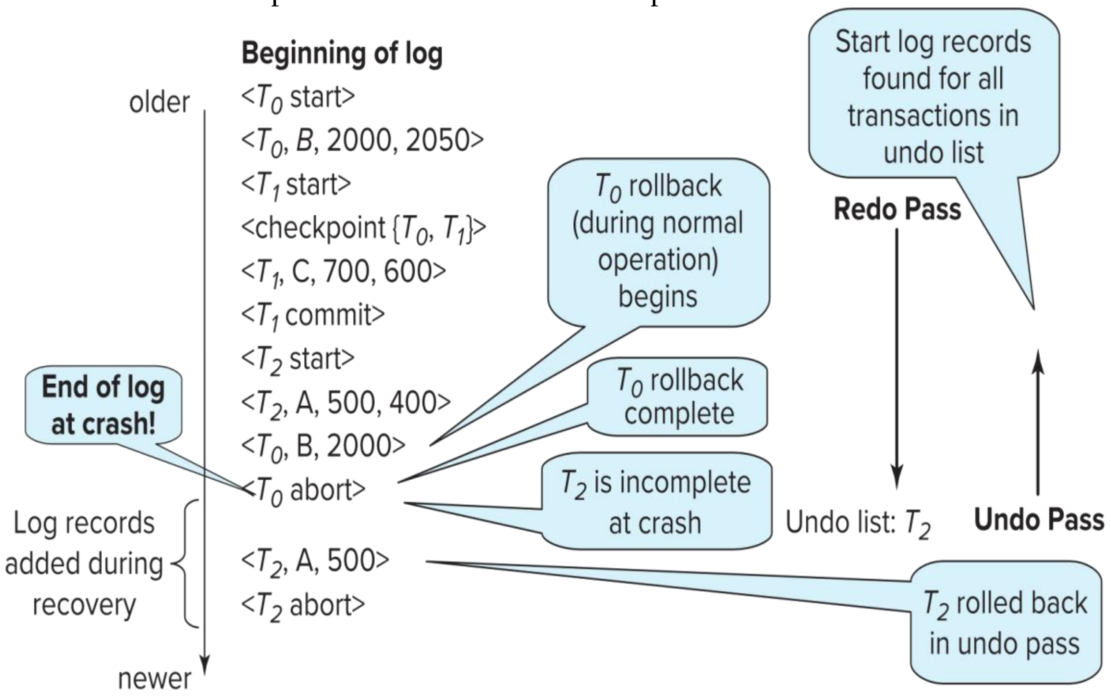


12. Suppose that we are using extendable hashing on a file that contains records with the following search-key values: 2, 3, 5, 7, 11, 17, 19, 23, 29 and 31. Show the extendable hash structure for this file if the hash function is h(x) = x mod 8 and buckets can hold three records. Also, Show how the extendable hash structure changes as the result of each of the following steps: (10) [CO4,K3]

a. Delete 11. b. Delete 31. c. Insert 1. d. Insert 15.



a. Delete 11  	b.Delete 31 
c. Insert 1  	d.Insert 15 

13.	Elucidate the functionalities of Lock based protocol with your own examples. Explanation about lock mechanism, Lock Matrix, 3 types of lock protocol with examples	(10)	[CO5,K2]
14.	Illustrate the recovery algorithm with your own example. Recovery Algorithm: ▪ Database systems, like any other computer system, are subject to failures but the data stored in it must be available as and when required. ▪ Recovery techniques are heavily dependent upon the existence of a special file known as a system log. ▪ The log keeps track of all transaction operations that affect the values of database items. ▪ **Recovery from failure**: Two phases • **Redo phase**: replay updates of **all** transactions, whether they committed, aborted, or are incomplete • **Undo phase**: undo all incomplete transactions • Examples similar to below are accepted  Beginning of log older <T_0 start> <T_0, B, 2000, 2050> <T_1 start> <checkpoint {T_0, T_1}> <T_1, C, 700, 600> <T_1 commit> <T_2 start> <T_2, A, 500, 400> <T_0, B, 2000> <T_0 abort> <T_2, A, 500> <T_2 abort> newer End of log at crash! Log records added during recovery T_0 rollback (during normal operation) begins T_0 rollback complete T_2 is incomplete at crash Start log records found for all transactions in undo list Redo Pass Undo list: T_2 Undo Pass T_2 rolled back in undo pass	(10)	[CO5,K2]

Bloom's Taxonomy Level	Remembering (K1)	Understanding (K2)	Applying (K3)	Analysing (K4)	Evaluating (K5)	Creating (K6)
Percentage	3	40	57	--	--	--