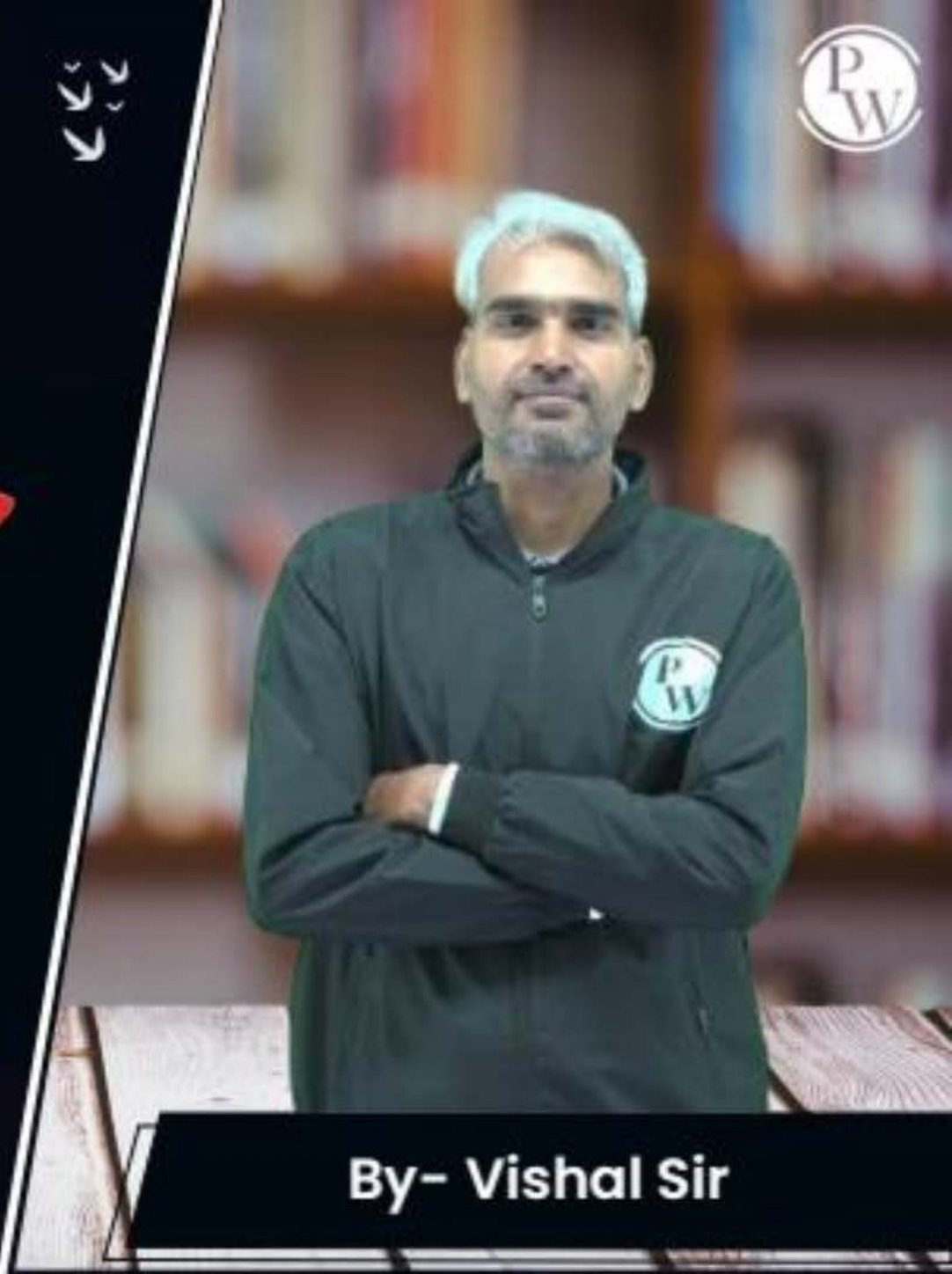
DS & AI

Database Management System

Super 1500+

Lecture No. 09



By- Vishal Sir

Recap of Previous Lecture

Topic File organization and Indexing

Slide

Topics to be Covered

- Topic: File organization and Indexing
- Topic: SQL

Slide

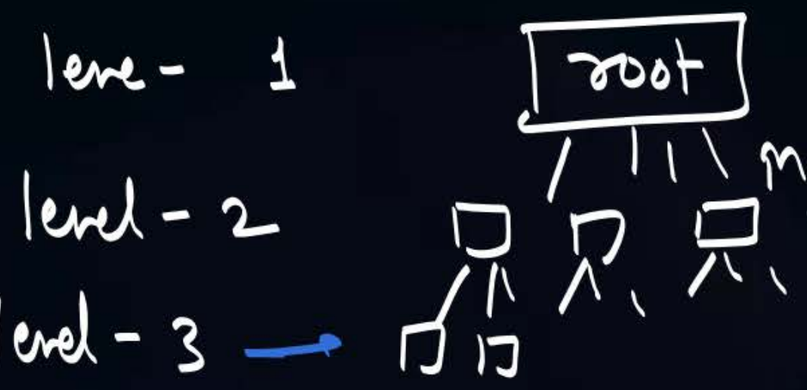
Record pointers will be only at leaf level.

- Max no. of child pointer in an internal node = 10
- Max no. of record pointer in leaf node = Max. no. of keys in leaf node = 10

#Q.54 Consider the B+tree of order 10. Assume that the number of levels in the tree is four including root. The maximum number of record pointers that can be stored in B+tree is

Ans = 10000

∴ We need to count maximum No. of nodes at leaf level only.



level - 1 → 1 node at root

Max 10 children

Max No. of node at level 2 = 1 * 10 = 10

Max 10 children of each node a previous level

Max No. of nodes at level - 3 = 10 * 10 = 100

Max 10 children of each node at previous level

Max. No. of nodes at level-4 = 100 * 10 = 1000

In a B+ tree of level 4 and order = 10,

We can have maximum '1000' nodes at leaf level.

And each node at leaf level can have maximum '10' record Pointer

∴ Maximum no. of Record Pointers = (1000) × (10) = 10,000

(1000) ↑ Max No of nodes at leaf

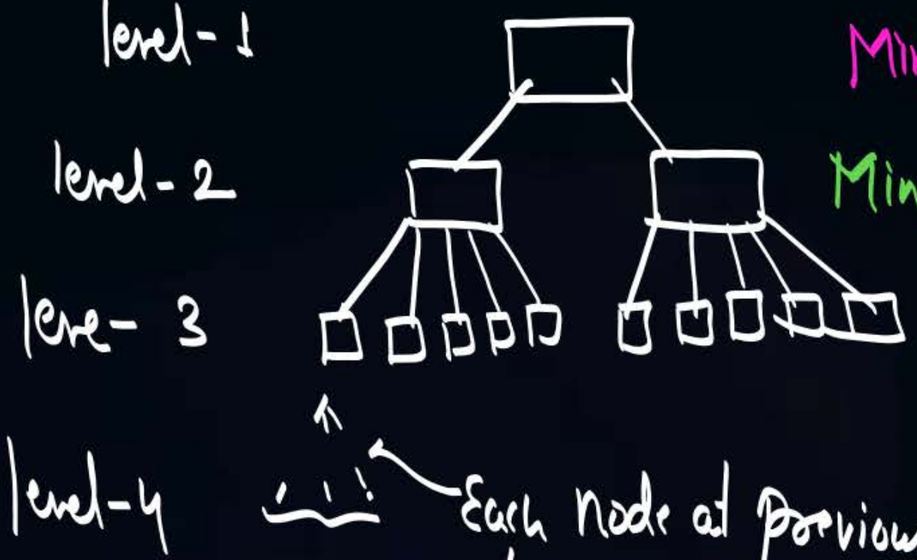
(10) ↑ Maximum No. of record ptr in each leaf node

Min no. of child ptr of a root node = 2

Min. no. of child ptr at non-root internal node = $\lceil \frac{10}{2} \rceil = 5$

#Q.55 Consider the B+tree of order 10. Assume that the number of levels in the tree is four including root. The minimum number of record pointers that can be stored in B+tree is _____

Min. No. of keys at non-root leaf node = $\lceil \frac{\text{order}}{2} \rceil = \lceil \frac{10}{2} \rceil = 5$



Min No. of nodes at level 1 = 1

Min. no. of nodes at level-2 = 1 * 2 = 2

Min no. of nodes at level-3 = 2 * 5 = 10

Min. No. of nodes at level-4 = 10 * 5 = 50

* Minimum '50' nodes at leaf level.
* and each node at leaf level must have minimum $\lceil \frac{10}{2} \rceil = 5$ record pointers.

∴ Min. no. of record pointers in a B+ tree of order = 10 and level = 4

$= \underbrace{50}_{\text{Min 50 nodes}} * \underbrace{5}_{\text{each with min '5' record Pointers}} = 250$

Case ①: When the question defines the orders explicitly for internal node and leaf node

Let order of internal node of B+ tree : q

And order of leaf node of B+ tree = m

→ Each leaf node can contain maximum of 'm' keys
And minimum $\lceil \frac{m}{2} \rceil$ keys for non-root leaf node

→ An internal node can contain maximum q child pointers and maximum $(q-1)$ keys
And minimum $\lceil \frac{q}{2} \rceil$ child pointer and $\lceil \frac{q}{2} \rceil - 1$ keys for non-root internal node

→ root node can contain minimum '1' key

Case ②: When only one order is defined for nodes of B+ tree.

Let order of a node of B+ tree = p

then for internal node
{ maximum p child pointer
& maximum $p-1$ keys
Minimum $\lceil \frac{p}{2} \rceil$ child pointer
&
Minimum $\lceil \frac{p}{2} \rceil - 1$ keys

Kartik

& for leaf node
maximum $(p-1)$ keys
Minimum $\lceil \frac{p-1}{2} \rceil$ keys

for leaf node
maximum $(p-1)$ keys
Minimum $\lceil \frac{p}{2} \rceil$ keys

Navathe

Case ①: When the question defines the orders explicitly for internal node and leaf node

Let order of internal node of B+ tree : 10

And order of leaf node of B+ tree = 10

Case ②: When only one order is defined for nodes of B+ tree.

Let order of a node of B+ tree = 10

Maximum child ptr of internal node = 10

Maximum No. of keys in internal node = 10-1 = 9

Minimum child ptr = $\lceil \frac{10}{2} \rceil = 5$

Minimum keys = $\lceil \frac{10}{2} \rceil - 1$

$= 5 - 1 = 4$

Maximum no. of keys in leaf node = (10-1)

Min. no. of keys = $\lceil \frac{10-1}{2} \rceil$

$= \lceil \frac{9}{2} \rceil = 5$

#Q.56 Consider the B+tree of order 10. Assume that the number of levels in the tree is four including root. The maximum number of record pointers that can be stored in B+tree is

Ans = 9000

Record pointers will be only at leaf level.

Max no. of child pointer in an internal node = 10

Max no. of record pointer in leaf node = Max. no. of keys in leaf node = 10

#Q.54 Consider the B+tree of order 10. Assume that the number of levels in the tree is four including root. The maximum number of record pointers that can be stored in B+tree is

∴ We need to Count maximum No. of nodes at leaf level only.

level - 1 — root — 1 node at root

level - 2 — Max 10 children — Max No of node at level 2 = 1 * 10 = 10

level - 3 → Max 10 children of each node a previous level — Max No. of nodes at level-3 = 10 * 10 = 100

level 4 — Max 10 children of each node at previous level — Max. No. of nodes at level-4 = 100 * 10 = 1000

In a B+ tree of level 4 and order = 10,

We can have maximum '1000' nodes at leaf level.

And each node at leaf level can have maximum (10-1) = 9 record pointers

∴ Maximum no. of Record Pointers = (1000) × 9 = 9000

(1000): Max No of nodes at leaf

9: Maximum No. of record ptr in each leaf node

#Q.56 Consider the B+tree of order 10. Assume that the number of levels in the tree is four including root. The maximum number of record pointers that can be stored in B+tree is

Ans = 9000

#Q.57 Consider the B+tree of order 10. Assume that the number of levels in the tree is four including root. The minimum number of record pointers that can be stored in B+tree is _____

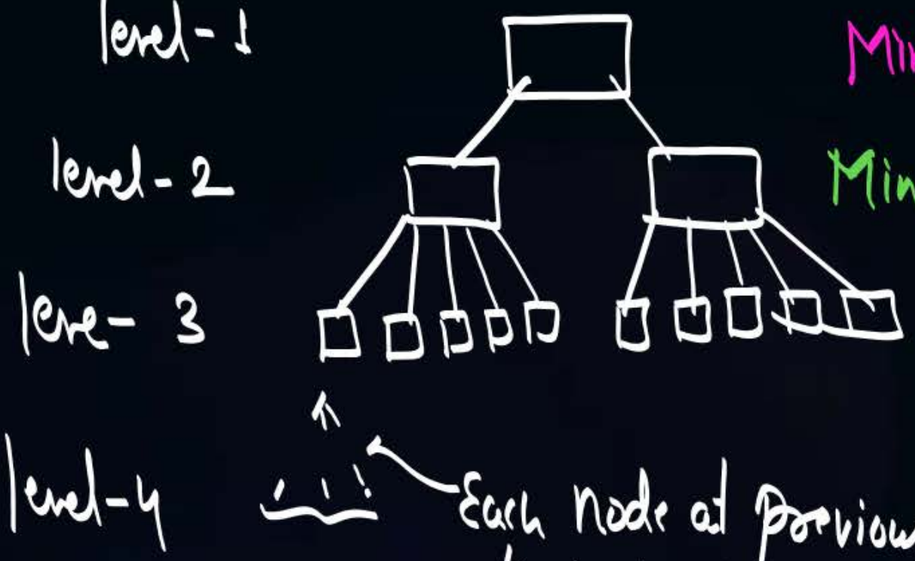
Ans = 250

Min no. of child ptr of a root node = 2

Min. no. of child ptr at non-root internal node = $\lceil \frac{10}{2} \rceil = 5$

#Q.55 Consider the B+tree of order 10. Assume that the number of levels in the tree is four including root. The minimum number of record pointers that can be stored in B+tree is _____

Min. No. of keys at non-root leaf node = $\lceil \frac{\text{order}}{2} \rceil = \lceil \frac{10}{2} \rceil = 5$



Min No. of nodes at level 1 = 1

Min. no. of nodes at level-2 = 1 * 2 = 2

Min no. of nodes at level-3 = 2 * 5 = 10

Min. No. of nodes at level-4 = 10 * 5 = 50

* Minimum '50' nodes at leaf level.
* and each node at leaf level must have minimum $\lceil \frac{10-1}{2} \rceil = 5$ record Pointers

∴ Min. no. of record pointers in a B+tree of order = 10 and level = 4

$= \underbrace{50}_{\text{Min 50 nodes}} * \underbrace{5}_{\text{each with min '5' record Pointers}} = 250$

#Q.57 Consider the B+tree of order 10. Assume that the number of levels in the tree is four including root. The minimum number of record pointers that can be stored in B+tree is _____

Ans = 250

#Q.58 Consider the following two relations

Parent

Drink

Drink_name	Type
~~Pepsi~~	soft
Kinley	water
~~Cola~~ Maza	soft

Child

Sell

Counter_no	Drink_name	Cost
1	~~Pepsi~~ NULL	2
1	~~Pepsi~~ NULL	1
1	Kinley	3
2	~~Cola~~ Maza	4
2	~~Cola~~ Maza	6
3	~~Pepsi~~ NULL	4

3 + 4 + 6 = 13

Drink_name in the Sell relation references to the Drink_name in the Drink relation. We use ON DELETE SET NULL and ON UPDATE CASCADE.

First we execute following two querries

Q1: DELETE FROM Drink WHERE Drink_name='Pepsi'

Q2: UPDATE Drink SET Drink_name='Maza' WHERE Drink_name='Cola'

Now what does the following query return?

SELECT SUM(Cost) FROM Sell WHERE Sell.Drink_name IS NOT NULL

distinct

#Q.59 Consider a relation schema Student(Sid, Sname, Marks) and following two querries.

Q1: SELECT Marks FROM Student S WHERE NOT EXISTS
(SELECT * FROM Student WHERE Marks > S.Marks)

Q2: SELECT MAX(Marks) FROM Student

Correlated Subquery

A Q1 and Q2 always produces the same answer

B Q1 and Q2 always produces the different answer

C Q1 and Q2 may produce same answer

D None of the above

#Q.59 Consider a relation schema Student(Sid, Sname, Marks) and following two querries.

distinct

Q1: SELECT Marks FROM Student S WHERE NOT EXISTS
(SELECT * FROM Student WHERE Marks > S.Marks)

Q2: SELECT MAX(Marks) FROM Student

A Q1 and Q2 always produces the same answer

B Q1 and Q2 always produces the different answer

C Q1 and Q2 may produce same answer

D None of the above

{ Marks may be NULL in some tuples }

w.r.t. them Q1 & Q2 may produce different answer

#Q.60 Consider two relation schema R(A, B) and S(C, B), and following two queries.

Q1: SELECT A FROM R
WHERE B ≥ALL (SELECT B FROM S WHERE C=1)

Q2: SELECT A FROM R
WHERE B ≥ANY (SELECT B FROM S WHERE C=1)

A Both the queries always produces same answer

B Tuples produced by query Q1 is always a subset of tuples produced by Q2

C Tuples produced by query Q2 is always a subset of tuples produced by Q1

D None of the above

#Q.61 Consider The following relational schema:

EMP(Eid, Ename)

Work_in(Eid, Did)

DEPT(Did, Dname)

If we want to retrieve the Eids of the the employees working for both finance and HR department then which of the following is true

A (Select distint W.Eid from Work_in W, DEPT D
Where W.Did=D.Did AND D.Dname = 'finance') Intersect
(Select distint W.Eid from Work_in W, DEPT D
Where W.Did=D.Did AND D.Dname = 'HR')

B Select distint W.Eid from Work_in W, DEPT D Where W.Did=D.Did AND D.Dname = 'finance' AND D.Dname = 'HR'

C Both (A) and (B)

D None of the above

#Q.62 Consider the following relations

Score

Sid	Sname	Marks	Subject
1	Ram	80	Maths
1	Ram	70	English
2	John	75	Maths
3	Rocky	80	English
2	John	65	Physics
3	Rocky	60	Maths

$\frac{215}{3} = 71....$

$\frac{150}{2} = 75$

65

Consider the following SQL query

Select * From Score S

Where S.marks >ANY (Select Avg(marks) from Score group by (subject))

independent

Numbers of tuples returned by above SQL query is 4.

#Q.63 Consider the relational database with following schema

Emp (Eid, Ename , dept-id)

Project (Pid , Pname , dept-id)

Works - on (Eid, Pid)

and the following SQL query

Select E.Eid from Emp As E where NOT EXITS

(Select Pid form Project where dept-id = 'D1')

EXCEPT (minus)

(Select Pid form Works - on Where (Eid = E. Eid))

The above query returns

(A) Eids of employees who works on all the projects of department 'D1'

(B) Eids of employees who does not work on any project of dept 'D1'

(C) Eids of employees who work on at least one project of department D1

(D) None of the above

Returns true when result is Empty

Select all Pids of department D1

independent

this query will select Pids of all project on which Employee is working

Correlated

2 mins Summary

Topic File organization and Indexing

Topic SQL

Slide

THANK - YOU