

13.2

41

record 0	10101	Srinivasan	Comp. Sci	65000
record 1				
record 2	15151	Mozart	Music	40000
record 3	22222	Einstein	Physics	75000
record 4	34556			
record 5	33456	Gold	Physics	87000
record 6	38356			67
record 7	58583	Califieni	History	62000
Record 8	76543	Singh	Finance	80000
record 9	76766	Crick	Biology	72000
record 10	83821	Brandt	Comp. Sci	92000
record 11	98345	Kim	Elec. Eng	80000
record 12				

Q) Insert (24556, Turzamian, Finance, 98000)

Indices are data structures that help a database find data quickly.

Ordered Indices : Filter

Data in the index is sorted
Good for range queries.

Hash Indices. frequently mapping.

Data is divided into buckets using a hash function

Example hash (StudentID = StudentID % 10)
might send student 103 to bucket 3.

Very fast for exact matches, like
"find student with StudentID = 103"

sequentially ordered file

जरूर नहीं होगा क्योंकि

A sequentially ordered file means the records in the file are physically stored on a disk in a sorted order based on some attribute.

A clustering index is an index built on the same attribute that defines the physical order of the file.

A clustering index is an index whose search key matches the physical order of the records in a file. The ph file is ordered by studentID.

If I create an index on studentID, that's a clustering index.

Block 1 → StudentID 101 - 105.

Block 2 → StudentID 106 - 110

Block 3 → StudentID 111 - 115.

→ Clustering Index.

Student ID

Pointer to Block

101

→ Block 1

106

→ Block 2

111

→ Block 3

Non clustering index is an index whose search key doesn't define the physical order of the records in the file. Can have many table based on the search key.

Data blocks (Clusters)

Non-cl

Clustering Index / Physical Index.

Non-clustering Index / Secondary Index.

On Insertion of a new record, we use the record pointed to by the header. We change the headers pointer to point to the next available record. If no space is available, we add the new record to the end of the file.

means file header যারে point রয়েছে, তখন blank record এর data insert হবে। Then header pointer এর update হবে এবং পরবর্তী blank record এর point রয়ে।

Heap File Organization

When stored in a heap file, these record could be placed anywhere in the data file, no specific order.

Block 1 102, Bob, EEE, 3.60

Block 2 103, Carol, CSE, 3.90

Block 3 101, Alice, CSE, 3.80

Records are not sorted by any of the search key.

To insert, it just finds a free space and adds the record there.

To delete or update, it searches for the record first, then performs the operation.

{ Block 1 → 101, 102 }

Block 2 → 103, 104

sequential File Organization

Block 1

stored records

Dept(CSE, Room 12)

Students: (101, Alice, CSE), (103, Carol, CSE)

Block 2

Dept(EEE, Room 34)

Students (102, Bob, EEE)

when a query like

Select students.name, department, office

from students natural join dept

where student.dept = dept.department

id	name	dept	office
101	Alice	CSE	12
102	Bob	EEE	34
103	Carol	CSE	12
104	Dave	EEE	34

linear

① Resolution by chain

② Open addressing

- Linear probing (primary cluster form 2023)
- Quadratic probing (primary cluster form 2023)

Hash

Keys are 5, 28, 19, 15, 20, 39, 12, 17, 10.

Consider hash table with 9 slots and the hash functions

$$h(k) = k \bmod 9$$

$$5 \bmod 9 = 5$$

$$28 \bmod 9 = 1$$

$$19 \bmod 9 = 1$$

$$15 \bmod 9 = 6$$

$$20 \bmod 9 = 2$$

$$39 \bmod 9 = 6$$

$$12 \bmod 9 = 3$$

$$17 \bmod 9 = 8$$

$$10 \bmod 9 = 1$$

0	
1	28
2	20
3	39
4	
5	5
6	15
7	
8	17

ds

$$h(k, i) = (k+i) \% m$$

10, 22, 31, 4, 15, 28, 17, 88, 59

i should start from 0, if the place is occupied i will increase.

$$h(10, 0) = (10+0) \% 11 = 10$$

$$h(22, 0) = (22+0) \% 11 = 0$$

$$h(31, 0) = (31+0) \% 11 = 9$$

$$h(4, 0) = (4+0) \% 11 = 4$$

$$h(15, 0) = (15+0) \% 11 = 4$$

$$h(15, 1) = (15+1) \% 11 = 5$$

$$h(28, 0) = (28+0) \% 11 = 6$$

$$h(17, 0) = (17+0) \% 11 = 6$$

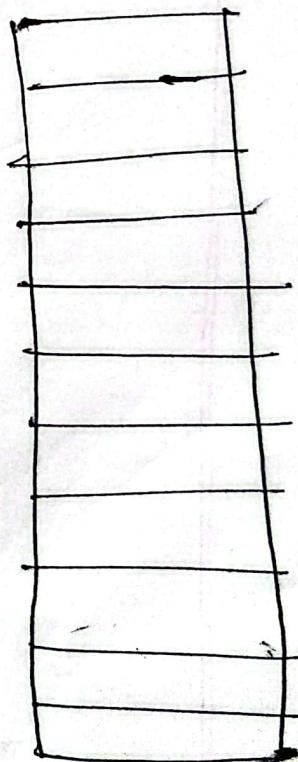
$$h(17, 1) = (17+1) \% 11 = 7$$

$$h(88, 0) = (88+0) \% 11 = 0$$

$$h(88, 1) = (88+1) \% 11 = 1$$

$$h(59, 0) = (59+0) \% 11 = 4$$

$$h(59, 1) = (59+1) \% 11 = 5$$



$$h(59, 2) = (59+2) \times 11 = 6$$

$$h(59, 3) = (59+3) \times 11 = 7$$

$$h(59, 4) = (59+4) \times 11 = 8$$

0	22
1	88
2	
3	
4	9
5	15
6	28
7	17
8	59
9	31
10	10