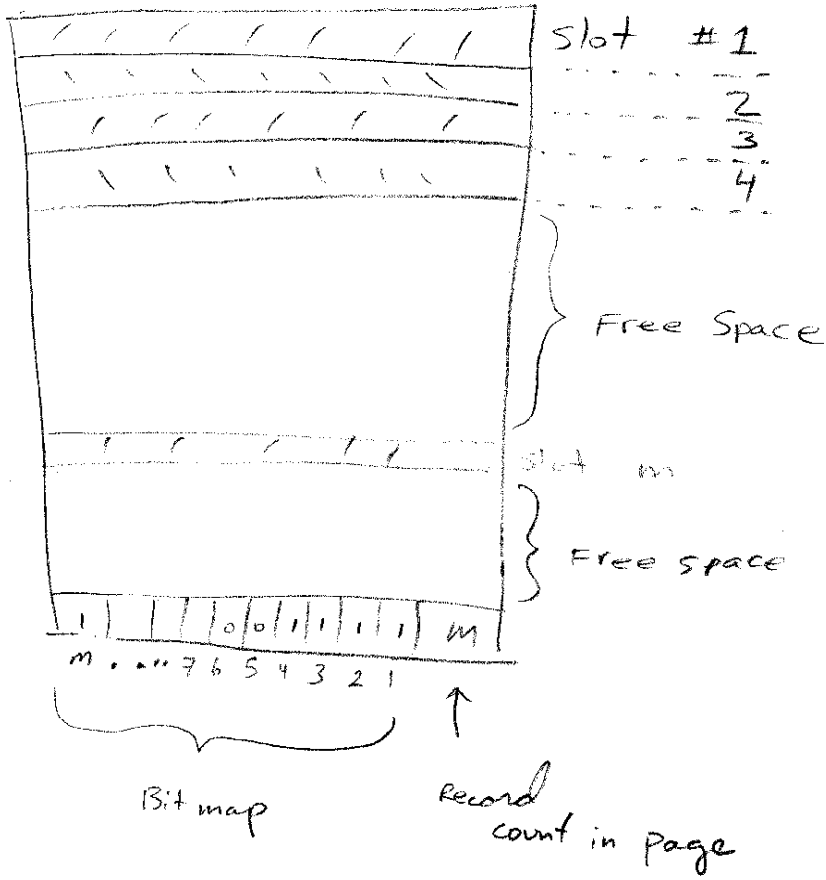


#1



Page is divided into slots

Each slot holds fixed length record

Bit map: 0 - slot empty
1 - slot holds record

2)

ALL - all objects user has privileges on
USER - all objects owned by a user
DBA - views useful to DB administrator

③

id=3 OR age=2 MATCHES but is useful

id=3 AND age=2 MATCHES definition

id=3 AND (age > 2) DOES NOT MATCH

A has index matches a CNF selection if there is a term of the form attribute = value in the selection for each attribute in the index's search key

Q.4. The heuristics are.

- ① Pushing selects & pushing projects below joins in a tree.
- ② Combine selects & cartesian products to make joins if possible.
- ③ reorder joins.
- ④ optimizer then sees which indexes match which in the resulting plans.

Reorder joins:

optimizer considers all possible left-deep orders using dynamic programming to pick lowest-cost ordering.

5

of pages = 100,000

rec. size = 50

page size = 4096

bfr = $\lfloor \frac{4096}{50} \rfloor = 81$

of passes = $1 + \lceil \log_{bfr} N \rceil$

$N = \lceil \frac{100,000}{81+1} \rceil$

total # I/O

$2 \times \# \text{ of pages} \times \# \text{ of passes}$

$2 \times 100,000 \times (1 + \lceil \log_{81} (\lceil \frac{100,000}{82} \rceil) \rceil) = 600,000$

⑥ Using index a to retrieve all satisfying tuples
Make a bitmap.

$\boxed{1 \ 1 \ - \ - \ 1 \ 1 \ 0 \ 1 \ - \ -}$
 ↓
 a=4

- Do the same for index b.
- Bitwise AND to get the result.
Use this bitmaps to figure which tuples to return.

7 $N = 1000$ pages.

tmp files (factor b, c from (a, b, c))

$$= \frac{1}{3} * 1000 \text{ I/Os.} \quad (\text{write to 1st hash}) \quad (\text{read to 2nd hash})$$

$$\begin{aligned} \text{I/Os} &= 1000 \text{ I/Os} + \frac{1}{3} * 1000 \text{ I/Os} + \frac{1}{3} * 1000 \text{ I/Os} \\ &= 1668 \text{ I/Os} \end{aligned}$$

(scan file) (tmp files) (tmp files)

Way 1

$$\begin{aligned} \sqrt{\frac{T}{f}} &\leq B \Rightarrow \sqrt{\frac{1000/3}{1.4}} \leq B \\ &\Rightarrow B = 16 \end{aligned}$$

Way 2

$$\begin{aligned} B &> \sqrt{f \cdot T} = \sqrt{1.4 * 334} \\ &\Rightarrow B = 22 \end{aligned}$$

⑧

$$M + N \left[\frac{M}{B-2} \right]$$

$$= 750 + 2000 \left[\frac{750}{8} \right]$$

$$= 188750$$

(9)

Using the same info as in (8) compute the # of I/Os needed if instead we did SORT-MERGE join

10 BUFFER PGS

$M \rightarrow 2000$ PGS

$N \rightarrow 750$ PGS

$$M = 2000 \quad \lceil \log_{B-1} M \rceil = 4$$

$$N = 750 \quad \lceil \log_{B-1} N \rceil = 4$$

$$2M \lceil \log_{B-1} M \rceil + 2N \lceil \log_{B-1} N \rceil + M + N = 2(2000)(4) + 2(750)(4) + 2000 + 750$$

$$\approx 24750 \text{ I/O}$$