ADB

Sheet 2 [Part 1]

Q14.4 B = 512b, block ptr = 6b, record ptr = 7b
r = 30'000 → Fixed-length

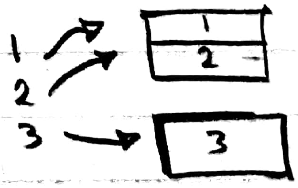
a] Record Length (R) = [30 + 9 + 9 + 40 + 9 + 8 + 1 + 4 + 4] + 1 = 115b
(fields) (del marker)

b] $Bfr = \lfloor B/R \rfloor = 4$ records/block

$\#B = \lceil r/Bfr \rceil = 7500$ blocks

c] Primary index on SSN, File is ordered by Key SSN.

* Index-Record size (R_i) = [SSN) size + block ptr) size] = 15b



هنا فيه idx بيشاور ع أول بلوك فيه الداتا

* Index blocking factor ($Bfr)_i$) $= \lfloor \frac{B}{R_i} \rfloor = \lfloor \frac{512}{15} \rfloor = 34$

* No 1st lvl index entries (r_1) = last #B = 7500 entry
* ——— blocks ($\#B_1$) $= \lceil r_1/Bfr_i \rceil = 221$ blocks

* 2nd lvl → entries (r_2) = 221
→ blocks ($\#B_2$) $= \lceil r_2/Bfr \rceil = 7$ blocks

* 3rd lvl → entries (r_3) = 7
→ Blocks ($\#B_3$) = 1

221 + 7 + 1
No blocks = 229
No I/Os = lvls + 1 = 4

* Max = 3 levels = $\lceil \log_{Bfr} \#B_0 \rceil$ (Bfr = 34, $\#B_0$ = 7500)

Follow 14.4

d] Secondary index on SSN (Key) → file not ordered by it.

* Index record size (R_i) = (SSN)$_{size}$ + (record ptr)$_{size}$ = 16
هنا ده معنى مترتب والـ ptr بيشاور على كل ريكورد، في الشيت تجاهل الكلمة ديه وحل على البلوك بس ده معنى صح.
ممكن تعمل أى حل منهم في الامتحان، في السكشن كملنا الحل الصح!

* index block factor (BFr_i) = $\lfloor \frac{512^{B}}{16_{R_i}} \rfloor$ = 32

* 1st LVL → entries (r_1) = 30'000 entries
→ blocks (B_1) = $\lceil r_1 / bfr_1 \rceil$ = $\lceil 30000/32 \rceil$ = 938 blocks

* 2nd LVL → entries (r_2) = 938
→ blocks (B_2) = $\lceil 938/34 \rceil$ = 28

* في أول هنا كله مترتب فهنرجع الـ BFr بتاعت الـ primary اللى هى 34

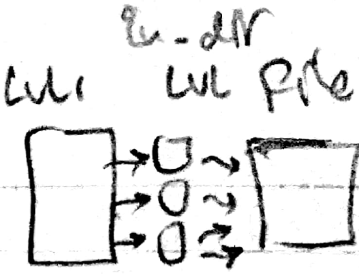
* 3rd LVL → entries (r_3) = 28
→ blocks (B_3) = 1

* No. LVLs = 3 = $1 + \lceil \log_{BFr} (B_1) \rceil$ = $1 + \lceil \log_{34} (938) \rceil$

* No. blocks = 938 + 28 + 1 = 967

* No. I/Os = No. LVLs + 1 = 4
(1 → actual block read)

No. I/Os → Block accesses



Follow 14.14

e] Secondary index on Dep Code → Non-Key → File not ordered by it

- It uses an extra LVL of indirection — من عصبه في
- 1000 unique DepCode — عبر الـ Levels عشان intermediates
- records are evenly distributed

* index Record size (Ri) = Dep code size + Block Ptr = 9 + 6 = 15b

* no of blocks in the intermediate level: $\frac{r \to 30K}{1000} = 30$ } 30 records has the same DepCode! each idx entry will have 30 ptr to records.

* The indirection LVL will use the record ptr (7b), so it will need (7 * 30) = 210b } → fits in one block (512b)
Hence, we only need 1000 blocks of the indirection LVL

* 1st → entries = 1000
  → blocks = ⌈1000/34⌉ = 30 blocks

• calc idx entry size
* decide how many blocks to store 1000 entry

* 2nd → entries = 30
  → blocks = ⌈30/34⌉ = 1

Block I/os ≡ Access

* No LVLs = 2
* No I/os = LVLs + intermediate LVL (1 block) + 1 (record) = 4
* No blocks = 1000 + 30 + 1 = 1031

ـ حيث ان الـ records متوزعة على 30 بلوك ، فمحتاجة 30 عملية تانى عشان نقدر نجيب كل الـ records

* 2 (2 LVLs) + 30 (30 blocks) + 1 (record) = 33 — السؤال هنا قالك عاوز نجيب كلها!

Follow 14.4

* Clustering index on DepCode → Non-key file ordered by it
  ↳ 1000 unique value evenly distributed
* index Record size (Ri) = DepCode + blockptr = 9+6 = 15b
* index block factor (bfri) = $\lfloor B/Ri \rfloor = 34$ index record per block
* 1st LVL → entries (r_1) = 1000 entries
  ↳ Blocks (B_1) = $\lceil r_1/bfr \rceil$ = 30 blocks
* 2nd LVL → entries (r_2) = 30
  ↳ blocks (B_2) = $\lceil 30/34 \rceil = 1$

* No LVLs = 2
* No blocks = 30+1 = 31 blocks
* No Ios (block access) = LVLs + 1 = 3
* No Ios to get all records = LVLs + 8 = 10 ??

the 30 records are clustered in $\lceil 30/bfr \rceil = \lceil \frac{30}{4} \rceil = 8$ blocks

$\lfloor B/R \rfloor = 512/115 = 4$

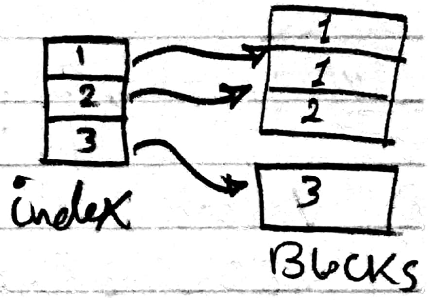
* For Primary Index → File ordered on a Key

→ $Bfr = \lfloor \frac{B_{size}}{R_{size}} \rfloor = \square$ Records/block

→ $Bfr_i = \lfloor \frac{B_{size}}{R_{i\,size}} \rfloor = \square$ Records/block

→ $r_i^{(i+1)} = \# B_i^{(i)}$

Record index size (R_i) = Key size + Block Ptr size



* For Secondary (Key, No order) → 1^{st} lvl ⇒ R_i = Key size + record Ptr size

$Bfr_{i})_1 = \lfloor B / R_i \rfloor$

→ 2^{nd} lvl ⇒ Same as Primary, New Bfr

* For Secondary (Non Key, No order)

→ 1^{st} lvl ⇒ R_i = Key + block Ptr size

→ 2^{nd} lvl ⇒ same as Primary, New Bfr

→ has intermediate lvl

↳ # blocks = $\frac{\text{Total } r}{\text{Count (Key)}}$ → $\square$

→ to get all records = no. lvls + 1 + $\square$

* For Cluster (Non Key, order)

→ Same as Primary

→ to get all records = lvls + $\frac{\text{Cluster blocks}}{}$ ← $\frac{1st \text{ lvl } \# \text{block}}{Bfr}$

Bfri مش العادى BFr