Sheet ④

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Course type : Audience Course

DePartment : Communications & Electronics

Database - Management System

Disc Storage, Basic file Structure, Hashing

[1] * keep some unused space in each block for new records.

* create „overflow/transaction„ temporary unordered file.
* Block transfer or bulk loading.
* indexing with Binary Search

& B- trees ≡ Balanced search trees.

[2] * Open- Addressing using { Lineur Probing, quadratic, double } ~ hashing

* Robin-Hood Hashing.
* Cuckoo Hashing.
* Extendible Hashing.

[3] B_{size} = 512 bytes → # blocks/track = 20

G_{size} = 128 bytes

Block	Gap

ⓐ
- useful cap of a track = $20 \times 512 = 10240$ bytes
- tot cap " " " = $20 \times (512+128) = 12800$ bytes

tracks/surface = 400

Double-sided Disk = 15

∴ # surfaces = $15 \times 2 = 30$

(b) * 400 cylinders

(c) * tot capacity of a cylinder = 30 * 12800 = 384000 bytes

Useful " " " " = 30 * 10240 = 307200 bytes

(d) * tot " " " disk pack = 400 * 384000 = 153600000 bytes

useful " " " " = 400 * 307200 = 12288 0000 bytes

(e) rotation speed = 2400 rpm

* transfer rate = $\frac{\text{tot cap. of a track} * \text{rotation speed (rpm)}}{60_{sec} * 1000_{msec}}$

$= \frac{12800 \text{ bytes} * 2400 \text{ rpm}}{60 * 1000}$

$= 512 \text{ bytes/msec}$

* $B_{lock}\ T_{ransfer}\ T_{ime} = \frac{T_{ime\ Per\ 1\ revolution}}{\#\text{Blocks Per track}}$

$BTT = \frac{60 * 1000 \text{ sec msec} / 2400 \text{ rpm}}{20 \text{ blocks}} = 1.25 \text{ msec}$

* $R_{otational}\ D_{elay\ (avg)} = \frac{BTT}{2} = 0.625 \text{ msec}$

* $B_{alk}\ T_{ransfer}\ R_{ate} = T_{ransfer}\ R_{ate} * \#\ of\ Surfaces$ ③

$= 512\ bytes/msec * 30\ surfaces/disk$

$= 15\ 360\ bytes/msec$

(f)

$$T_{ime\ avg\ Locate\ \&\ transfer} = T_{ime\ seek\ avg} + RD_{avg} + BTT$$

bytes / R | Time

$= 30_{msec} + 0.625_{msec} + 1.25\ msec$

$= 31.875\ msec$

(g) $T_{ime\ avg\ of\ random\ blocks} = 20\left[T_{seek\ avg} + RD_{avg} + BTT\right]$

$= 20 * 31.875 = 637.5\ msec$

$T_{ime\ avg\ of\ Consecutive\ using\ Prefetching\ the\ next\ block\ in\ double\text{-}buffering} = T_{seek\ avg} + BTT$

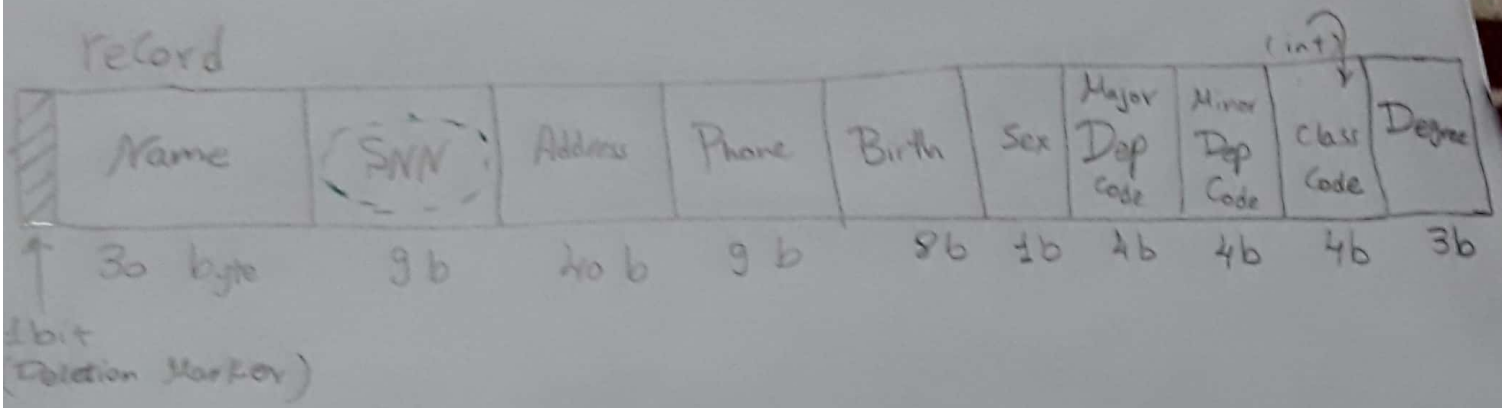
$= 30 + 1.25$

$= 31.25\ (msec)$

4 a file

$r_{record} = 20,000$ Student record [Fixed-length]

record



(a) ∴ record size = $1 + 30 + 9 + 40 + 9 + 8 + 1 + (4*3) + 3$

$R_{size} = 113$ bytes

(b) BFR (bfr) Blocking factor $= \dfrac{\text{block size}}{\text{Record length}}$

$= \dfrac{512 \text{ bytes}}{113 \text{ bytes}} = 4.53$

$\#$ of file blocks $= \left\lceil \dfrac{r}{bfr} \right\rceil = \dfrac{20,000}{\left(\frac{512}{113}\right)} = 4414.06$

(Ceiling up) $\simeq 4415$

(c) $T_{avg} = T_{seek\ avg} + BTT = 31.25$ msec

Double buffering
Stored - Contiguously
Linear Search

$T_{time\ avg} = T_{seek\ avg} + RD + BTT$

not - stored contiguously

linear Searching

$= 31.25 + 0.625$

$= 31.875$ msec

(d) # Disk Accesses in Binary Search $= \log_2 B = \log_2 4415 \simeq 12.108 \simeq 13$ times

($B \downarrow$ (# of files Blocks))

$T_{Binary\ Search} = 13 * [T_{seek} + BTT]$

$= 13 * 31.25_{msec} = 409.63_{msec}$

$\simeq 0.4$ sec