CS & IT ENGINEERING

Computer Organization & Architecture

Disk

DPP 01 Discussion Notes

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[NAT]

1 rotation time = 10 ms

#Q. Consider a disk with 1000 sectors per track. Disk rotates with 6000 rpm. Seek time is 10ms. The disk access time is _____ milliseconds?

Disk access time $= 10\,ms + \frac{10}{2} + \frac{10}{1000}$

$= \underline{\underline{15.01}}\,ms$ Ans.

[MCQ]

#Q. The transfer time T of the disk is

A. $\frac{2b}{rN}$

B. $\frac{rb}{N}$

C. $\frac{rN}{b}$

D. $\frac{b}{rN}$

for r rotations time = 1 sec

for 1 —— " —— = $\frac{1}{r}$ sec

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for N bytes, time = $\frac{1}{r}$

for b —— " —— = $\frac{1}{rN} * b$

[MCQ]

#Q. The total average read or write time on disk ~~total~~ t_{total} is?

A. $T_S + \frac{1}{2r} + \frac{b}{N}$

B. $T_S + \frac{1}{2r} + \frac{b}{rN}$

C. $T_S + 2r + \frac{b}{rN}$

D. $\frac{T_S}{rN} + \frac{b}{N}$

seek time + $\frac{1 \text{ rotat}^n \text{ time}}{2}$ + Transfer time = $T_S + \frac{1}{2r} + \frac{b}{rN}$

[MCQ]

1 rotation time $= \frac{60000}{15000} = 4\,ms$

#Q. Consider a disk with an average seek time of 4 ms, rotational delay of 2 ms, rotation speed of 15000 r.p.m. and 512-byte sectors with 500 sectors per track. A file occupies all of the sectors on 5 adjacent tracks. After reading the first track, if remaining tracks can be read with no seek time, then the time required in sequential organization to transfer the file will be nearly?

A. 0.01 seconds

B. 0.034 seconds

C. 0.34 seconds

D. 3.4 seconds

$$= \text{seek time} + 5 * \text{rotational latency} + 2500 * 1 \text{ sector transfer time}$$

$$= 4ms + (5 * 2\ ms) + 2500 * \frac{4\ ms}{500}$$

$$= 4 + 10 + 20$$

$$= 34\ ms$$

$$= 0.034\ sec$$

[MCQ]

#Q. Consider a hard disk with 36 recording surfaces (0-35) having 10000 cylinders (0-9999) and each track contains 64 sectors (0-63). Data in disk are organized cylinder-wise and the addressing format is <cylinder no., surface no., sector no.>. A file in the disk is stored starting from address <1660, 28, 38> on 55788 sectors in contiguous manner. The address in format <c, h, s> for the last sector of the file is?

c h s

A. <1685, 0, 17>

B. <1685, 17, 0>

C. <1686, 16, 0>

D. <1686, 0 16>

no. of sectors per track (n_t) = 64

—— " —— cylinder (n_c) = 36 * 64 = 2304

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sector no. = (1660 * 2304) + (28 * 64) + 38

= 3826470

sector no. of last sector of file = 3826470 + 55788 − 1

= 3882257

$$c = \lfloor 3882257 / 2304 \rfloor = 1685$$

$$h = \lfloor (3882257 \% 2304) / 64 \rfloor = 0$$

$$s = (3882257 \% 2304) \% 64 = 17$$

[NAT]

#Q. Consider a memory hierarchy with 2-levels of cache. The L1-cache has 80% hit rate with 5ns access time. The L2-cache has 90% hit rate with 40ns of access time. The main memory has access time of 200 ns. The average memory access time is ____ns?

$$\text{Avg MAT} = 5 + \underbrace{0.2(40 + 0.1 \times 200)}_{12}$$

$$= 5 + 12$$

$$= 17\,ns$$

[NAT]

#Q. A multilevel cache system has access probability of L1 cache, L2 cache and main memory are 0.95, 0.042 and 0.008 respectively. The L1 cache, L2 cache and main memory have access time 10ns, 100ns and 1000ns respectively. The average memory access time of the memory hierarchy is _____ns?

$$\text{Avg MAT} = 0.95 \times 10 + 0.042(10 + 100) + 0.008(10 + 100 + 1000)$$

$$= 9.5 + 4.62 + 8.88$$

$$= \underline{23 \text{ ns}}$$

[NAT]

#Q. Consider a fully associative cache of size 32Kbytes. The cache uses x bytes block. Consider the main memory address is of 20 bits. The tag in main memory address is of 13 bits the value of x is __128__ bytes?

1 block size = x bytes

Block size = 2^7 = 128 Bytes

[NAT]

#Q. Consider a disk with an average seek time of 5 ms, rotation speed of 12000 r.p.m. and 1Kbytes sectors with 1000 sectors per track. A file occupies 520 sequential sectors on a track. The time required in sequential organization to transfer the file will be nearly _____ milliseconds?

12000 r — 1 min

$\Rightarrow$ 1 r — $\frac{1 \text{ min}}{12000} = \frac{60 \text{ sec}}{12000} = \frac{60 \times 1000}{12000} = 5 \text{ ms}$

Total file transfer time $= 5 + \frac{5}{2} + 520 \times \frac{5}{1000} = 10.1 \text{ ms}$

[NAT]

No of sectors per cylinder = 6 × 12 × 100 = 1200 sectors

#Q. Consider a disk with an average seek time of 10 ms, rotation speed of 10000 r.p.m. and 1Kbyte sectors with 100 sectors per track. Disk has 6 platers, each with two recording surface. A file of size 2650Kbytes is stored sequentially cylinder wise in the disk. The time required in sequential organization to transfer the file will be nearly _____ milliseconds?

10000 r — 60 sec

1 r — $\frac{60 \times 1000}{10000}$ ms = 6 ms

File size — $\frac{2650 \text{ KB}}{1 \text{ KB}}$ = 2650 sectors

No of cylinders = $\left\lceil \frac{2650}{1200} \right\rceil$ = 3

C_1	C_2	C_3
1200	1200	250

Total surfaces = 12 + 12 + 3 = 27

File transfer time

= (3×10) + (27 × 3) + 2650 × $\frac{6}{100}$

= 30 + 81 + 159

= 270 ms

THANK - YOU