CS & IT ENGINEERING

Computer Organization Architecture

Magnetic Disk

DPP- 01

Discussion Notes

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[NAT]

#Q. Consider a direct mapped cache of size 32 Kbytes. The cache uses 64 bytes block. Consider main memory address is of 20 bits. For the main memory address $(94347)_{10}$, the tag is $(\_\_\_)_{10}$?

mm block no. $= \left\lfloor \frac{94347}{64} \right\rfloor = 1474$

Tag $= \left\lfloor \frac{1474}{512} \right\rfloor = \underline{\underline{2}}$ Ans.

no. of blocks in cache $= \frac{32kB}{64B} = \frac{2^{15}}{2^6} = 2^9 = 512$

[NAT]

Ans = 0

#Q. Consider a 2-way set associative cache of size 256 Kbytes. The cache uses 32 bytes block. Consider main memory address is of 20 bits. For the main memory address $(86147)_{10}$, the tag is $(\_\_\_)_{10}$?

no. of blocks in cache $= \frac{256KB}{32B} = \frac{2^{18}}{2^5} = 2^{13}$

no. of sets in cache $= \frac{2^{13}}{2} = 2^{12} = 4096$

mm block no. $= \left\lfloor \frac{86147}{32} \right\rfloor = 2692$

Tag $= \left\lfloor \frac{2692}{4096} \right\rfloor = 0$

[NAT]

Tag is mm block no.

#Q. Consider a fully associative cache of size 16Kbytes. The cache uses 128 bytes block. Consider main memory address is of 20 bits. For the main memory address $(5182)_{10}$, the tag is $(\_\_\_)_{10}$?

mm block no. $= \left\lfloor \frac{5182}{128} \right\rfloor = \underline{\underline{40}}$ Ans.

[MCQ]

#Q. A 2-way set associative cache with LRU cache replacement contains 8 blocks. The CPU requests for main memory blocks in following sequence:

8, 12, 0, 1, 5, 8, 1, 12, 8, 0, 1, 3, 6, 7, 3, 11, 2, 3, 6, 2, 8, 7, 11

Number of cold, capacity and conflict misses respectively are?

no. of sets = $\frac{8}{2}$ = 4

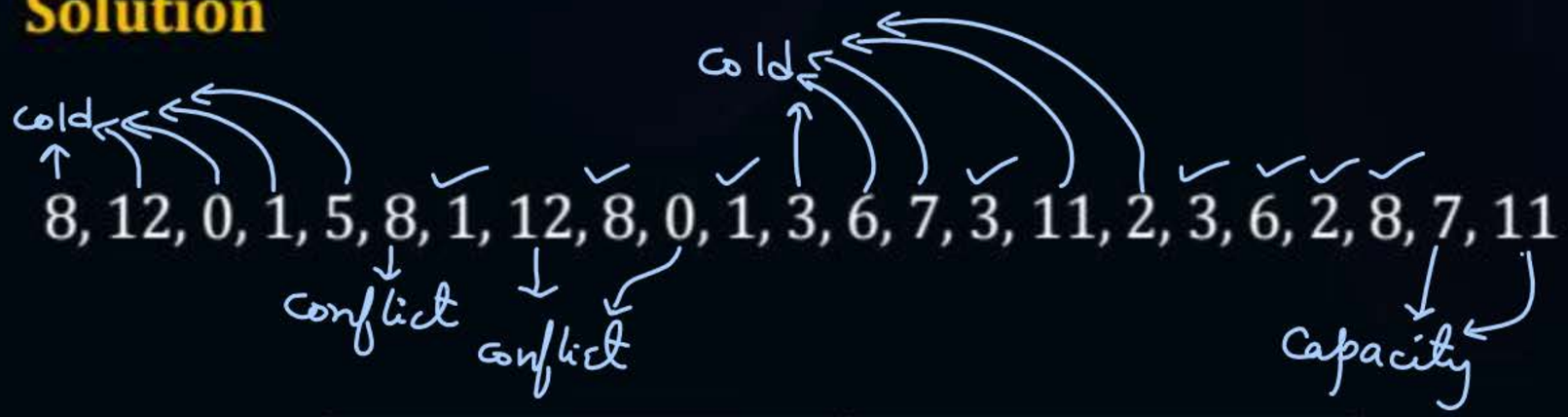
A 10, 3, 2

B 10, 2, 3

C 9, 3, 2

D 9, 2, 3

Solution



0	~~8~~ ~~0~~ ~~12~~ 0	~~12~~ 8
1	1	5
2	6	2
3	3	~~7~~ ~~11~~ 7

[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?

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

$$= 15.01\,ms \quad \text{Ans.}$$

[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]

t_{total}

#Q. The total average read or write time on disk ~~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

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

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

$$= 4 + 10 + 20$$

$$= 34\text{ ms}$$

$$= 0.034\text{ sec}$$

[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?

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

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

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

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

THANK - YOU