CS & IT ENGINEERING

Computer Organization Architecture

Cache Organization

DPP 01 Discussion Notes

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[NAT]

#Q. A cache is used to reduce the effective memory access time of 200ns without cache to 65ns with cache. If cache access time is 50ns, then cache hit rate is _____%?

With our cache Memory access time = our main memory access time = 200 ns

Memory access time = Averg MAT

$= 65 = H \times 50 + (1-H) \times 200$

$= H = 0.9 = 90\%$

[NAT]

#Q. A computer system has a cache with cache access time Tc = 10ns, hit ratio of 80% and average memory access time of Tm = 20ns. The access time for physical memory Tp is _____ ns?

Tc = 10ns

Average Memory time = 0.8 x 10 + 0.2 x Tp

Tp = 60ns

[NAT]

#Q. A cache line has 128 bytes. The main memory has addressing latency 64ns and access bandwidth 1GB/s. The time required to fetch the entire cache line from the main memory is _____ ns?

1 GB ——— 1 sec

128 byte data = (1 sec * 128 Byte) / 1 GB

= 128

= latency time + block access

= 64 + 128

= 192 ns

[NAT]

#Q. Consider a system using a cache. The cache is having 70% hit ratio and is 9 times faster than main memory. The average memory access time then increased due to some program execution and the new average access time becomes 40% more than older one of 340ns. The hit ratio of new cache design is ___%?

Old average MAT = 340 ns

$340 = 0.7 \times T_{cm} + 0.3 T_m$

$T_{cm} = 340/34 = 100$ ns

$T_{mm} = 9 \times 100 = 900$ ns

$= 1.4 \times 340 = 476$

$476 = H \times 100 + (1-H) \times 900$

$H = \frac{424}{800} = 0.53$

[NAT]

#Q. Consider a memory hierarchy which takes 500 nanoseconds for access when there is a miss in cache and takes 100 nanoseconds for access when there is a hit in cache. Assume if among all memory references 90% of the references are having a hit on cache then average memory access time is _____ nanoseconds?

Average Memory access time ⇒

$0.9 \times 100 + 0.1 \times 500$

$= 140$ ns

[MCQ]

#Q. A system has a write through cache with access time of 100ns and hit ratio of 90%. The main memory access time is 1000ns. 70% of memory references are for read operations. Average memory access time for read-write operations both and effective hit rate(in %) are?

AMAT wo = MAT = 1000 ns

A 433, 90%

B 433, 63%

C 190, 90%

D 190, 63%

0.7 x 190 + 0.3 x 1000 = 433 ns

Effective Hit Rate = Hit Rate end x % of Read op

= 0.9 x 0.7 = 63%

[NAT]

#Q. Consider a write through cache which can provide only 63.75% of effective hit rate. If among all memory references 75% references are for read, then the hit ratio of cache for only read operations ___%?

Effective Hit-Rate = Hit-Rate for end % of Read operations

0.6375 = Hit Rate of for Read × 0.75

= 0.6375 / 0.75 = 85%

[NAT]

#Q. Consider a write through cache which can provide only 61.92% effective hit rate. If among all memory references 28% references are for write, then the hit ratio of cache for only read operations is ____?

% of Read operation = 100 − 28 = 72%

EHR = Hit rate of and % of Read operation

0.6192 = " × 0.72

= 0.86 ⇒ 86%

THANK - YOU