* Write Back and Write through

Write Back	Write through
1. Data is updated only in CM	1. Data is updated both in CM and MM
2. Simple method to implement	2. Complex method to implement
3. When a cache block is not required then selected cache block is written back to MM to UPDATE the main memory.	3. When cache block is not required, there is no need to written back to main memory
4. commonly used method	4. unpopular method
5. Unreliable Method	5. Reliable Method
No Data Redundancy	6. Data Redundancy
No wastage of time as data updates occurs only in CM	7. Wastage of time as each data updates both in cache and main memory

= Cache Performance :

$$\text{Hit Ratio (h)} = \frac{\text{No. of Hits}}{\text{Hit + Miss}} = \frac{\text{Total No. of Hits}}{\text{Total No. of CPU Reference}}$$

$$\text{Miss Ratio (1-h)} = \frac{\text{No. of Miss}}{\text{Hit+Miss}} = \frac{\text{Total No. of Miss}}{\text{Total No. of CPU Reference}}$$

Cache Access Time – Time required to access word from Cache (Cache Hit Time)

Miss Penalty (Cache Miss time Penalty) – The time required to fetch the required block from MM.

$$\text{Avg. Access Time of CPU} = \text{Hit Ratio} \times \text{Cache Access Time} + (1-\text{Hit Ratio}) \times \text{Miss Penalty}$$

$$= h \times T_c + (1-h)\, T_m$$

(Cache + Main memory access time)

Q The access time of a cache memory is 100 ns and that of MM 1000 ns. It is estimated that 80% of the memory requests are for read and the remaining 20% for write. The hit ratio for read accesses only is 0.9. A write through procedure is used.

(a) what is the average acess time of the system considering only memory read cycle.

b) what is the average access time of the system for both read and write cycle.

c) what is the hit ratio taking into consideration the write cycles

Sol^n: Avg Access time of System(CPU) = Hit Ratio x Cache Access time + (1 - Hit ratio) x Miss Penalty

$= h \times T_c + (1-h) \times T_m$

a) Total read access time $= 0.9 \times 100 + (1-0.9) \times (100+1000)$

$= 90 + 0.1 \times 1100 = 90+110 = 200$ ns

Total write access time $= 1 \times \max(100, 1000)$ (t_m, t_{MM})

$= 1000$ ns

b) Avg. access time for both read & write

= 80% are Read request + 20% are write request

$= 0.8 \times 200 + 0.2 \times 1000$

$= 3160 + 200 = 360$ ns

c) Hit Ratio $= 0.8 \times 0.9 + 0.2 \times 0$

$= 0.72$