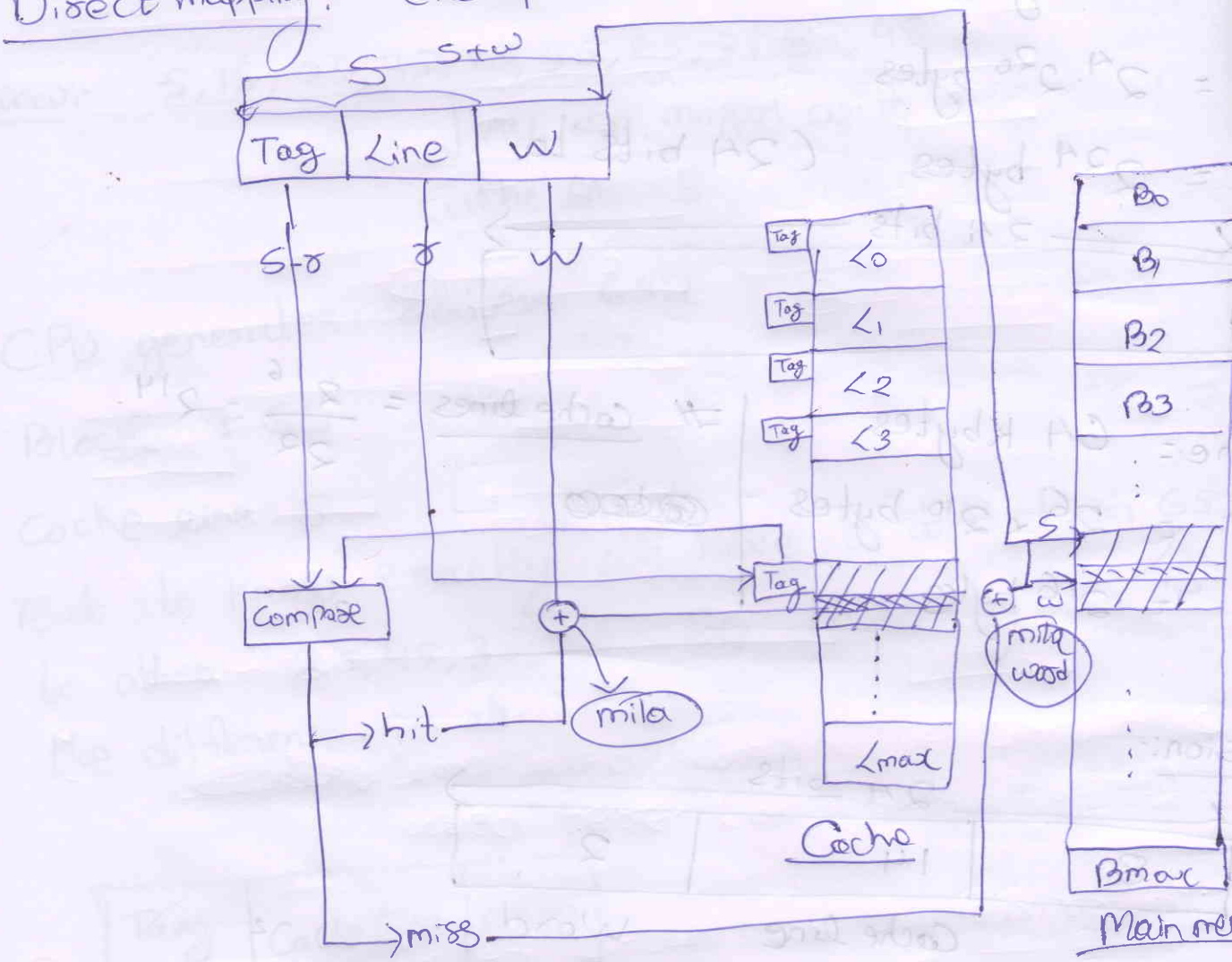
Mapping function (Hamacher/Stallings)

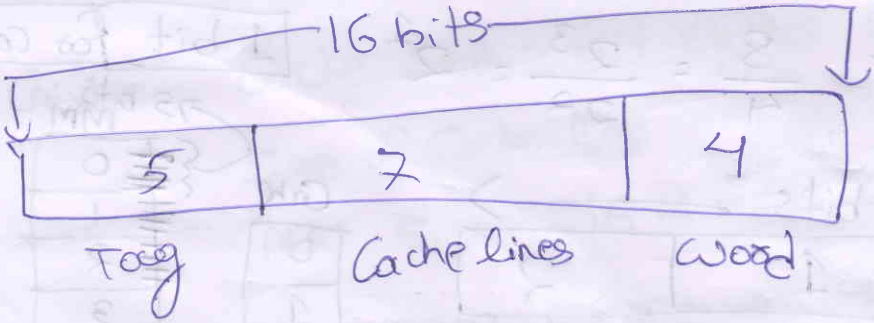
Direct mapping :- (Recap)



Size of Main memory = 64K words = $2^6 \cdot 2^{10} = 2^{16}$

blocks in cache = 128 = 2^7

size of a block = 2^4 words



How do you divide mm address in Tag. and word for direct mapping?

Disadvantages:-

Each block in main memory is mapped into a fixed cache line.

5, 55 → Same cache line 5 (From previous example)

↑ ↑

C = A + B

) First it fetches 5 with a hit in cache and 5 cache line is deleted

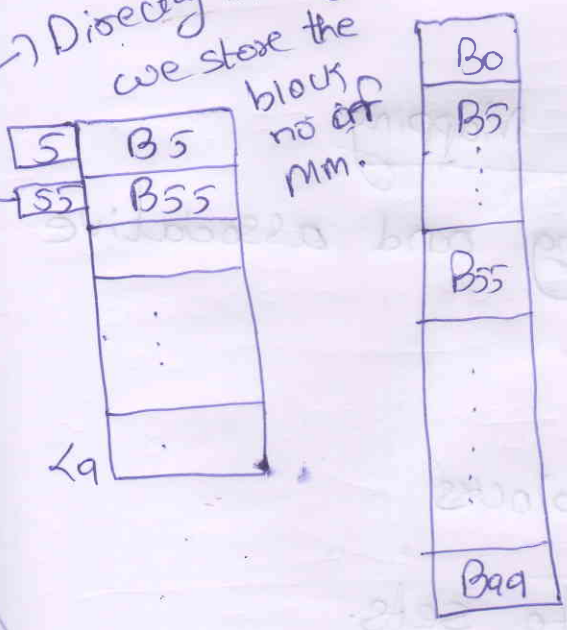
) Now for 55, there is a miss so that again 55 is fetched into new 5th cache line and the word is fetched.

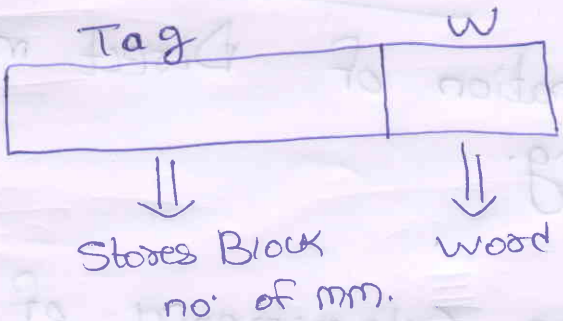
So Repeated Catch miss occurs

Associative mapping:-

⇒ A block can be mapped in any cache line.

) Directly in tag we store the block no of MM.

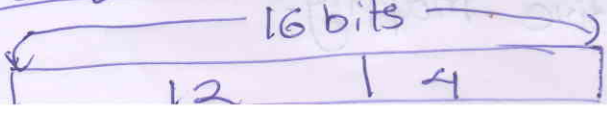




Eg:- 6582

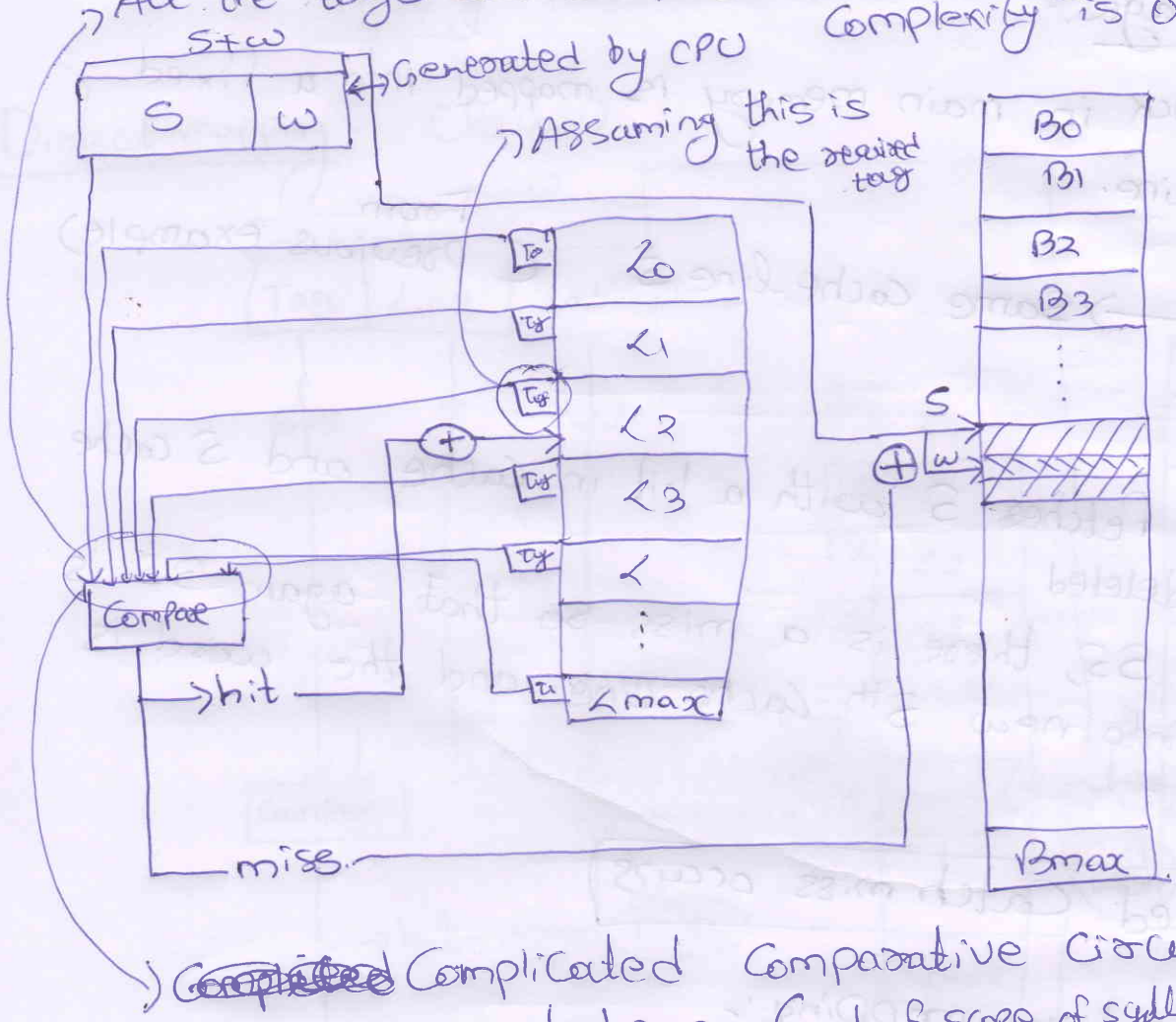
Tag	W
65	2

Eg:- This question



No of Blocks in MM = $\frac{2^{16}}{2^4} = 2^{12}$

Tag stores Block no so needs 12 bits



) ~~Complicated~~ Complicated Comparative circuit is used here. (out of scope of syllabus)

Drawbacks: Complex circuit for tag comparision.

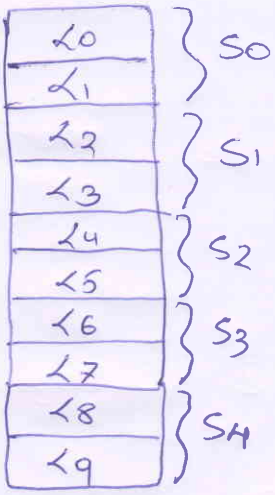
Set-Associative Mapping

Combination of Direct mapping and associative mapping.

-) Assume Cachememory of 10 blocks
-) Cache lines are grouped into sets.
-) Apply direct mapping with sets and then with a set apply associative mapping.

Note:- There is no sets in the mm.

S = j modulo #set



In the above example:-

If $j = 56$, # sets = 5

$S = 56$ modulo 5

$= 1.$

S_1 is selected.