

## PROBLEMS

Q.	MM Size	Cache Size	Block Size	Tag Bits	Tag directory Size	Set Associative
<u>Comp</u>						
2-4 bit	128 KB	16 KB	256 B	4	$4 \times 2^6$	2
4-22 bit	32 GB	32 KB	1 KB	22	$22 \times 2^5$	4
8-7 bit	<del>2</del> B	512 KB	1 KB	7	$7 \times 2^9$	8
4-10 bit	16 GB	64 MB	4 KB	10	$10 \times 2^{14}$	4

1)  $PA = 17 \text{ bits}$  ,  $BO = 8 \text{ bits}$

$$\# \text{ Lines} = \frac{CS}{BS} = 2^6 = 64$$

$$\# \text{ Set} = \frac{2^6}{2} = 32 \rightarrow \# \text{ set members} = 5$$

$$\# \text{ Tag} = 4$$



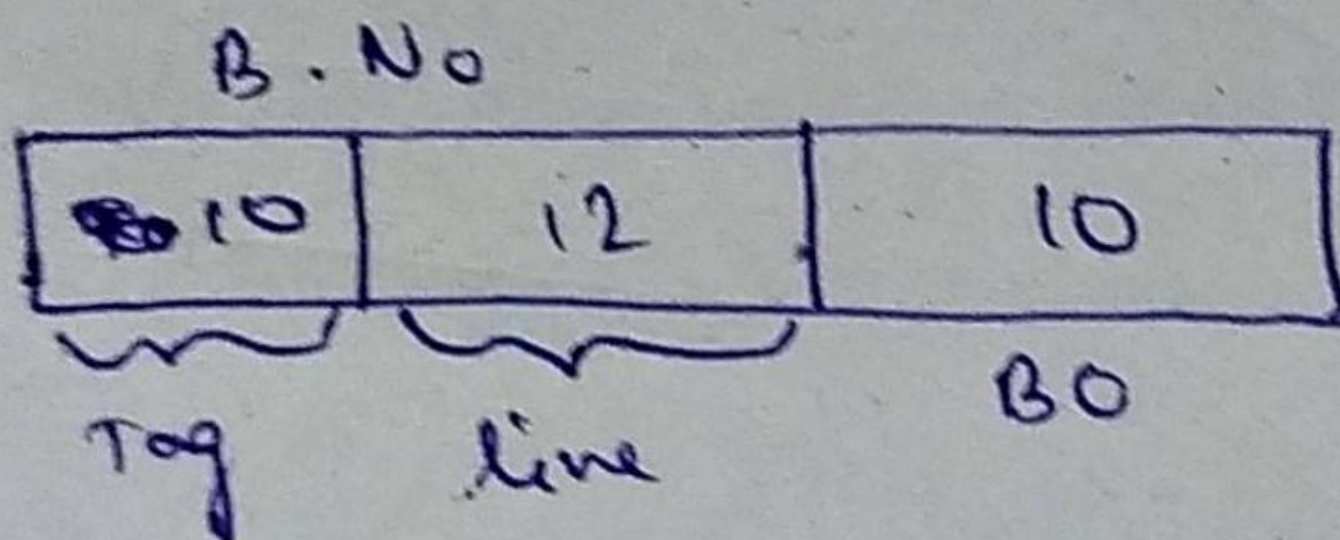
## COMPARING ALL MAPPINGS

Main Memory = 4 gb , Cache = 4MB , Block = 1KB

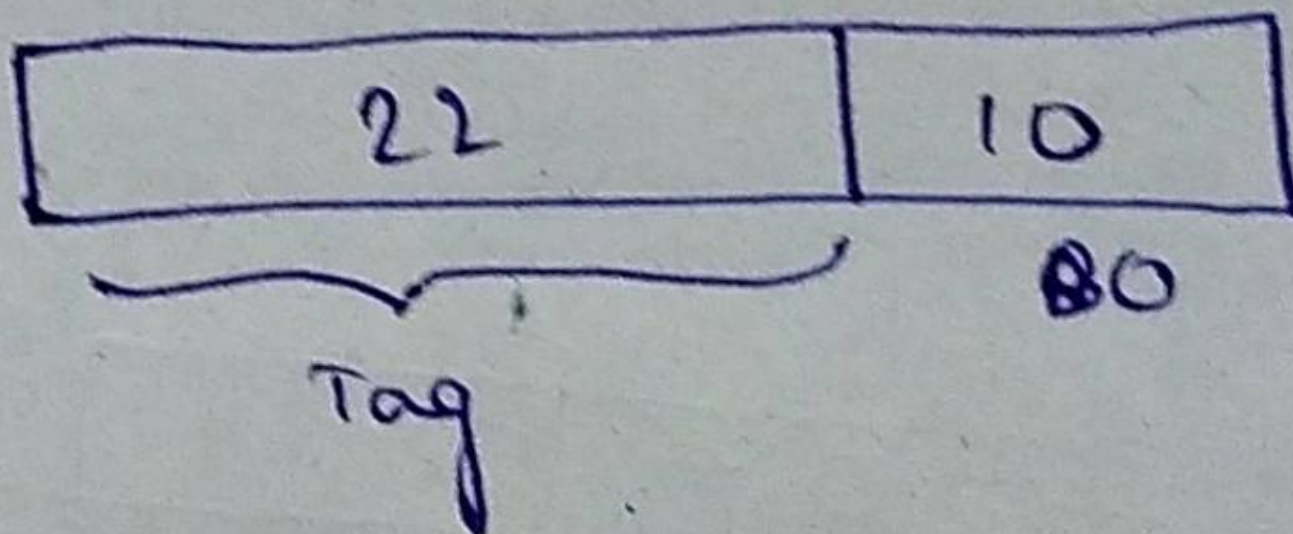
Direct Mapping (K-way where  $K = 1$ )

PA = 32 bits

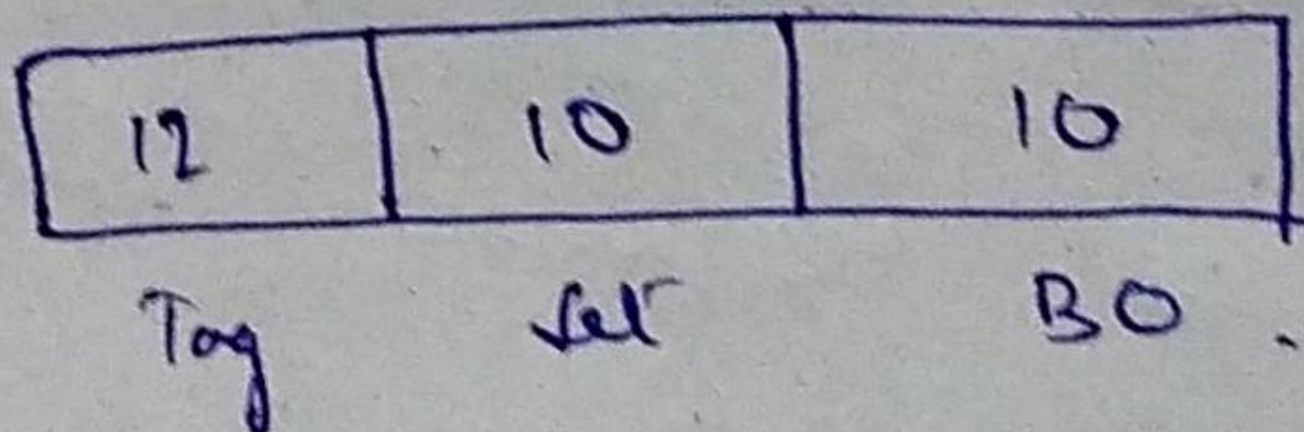
# line =  $\frac{CS}{BS} = 2^{12}$  , block offset = 10



Associative Mapping:  
(K-way  $\forall K = N$ )



4 way set associative:





	TAG	COMPARATOR	Tag Size	lines	size of comp
DIRECT	10	1	$10 \times 2^{12}$	$2^{12}$	10
ASSOCIATIVE	22	$2^{12}$	$22 \times 2^{12}$	$2^{12}$	22
SET ASSOCIATIVE	12	4	$12 \times 2^{12}$	$2^{12}$	12

Q. Main memory has  $2C$  blocks and cache has  $2C$  blocks.

It is 2 way set associative. Then  $K$ th block of main memory

maps to \_\_\_\_\_

→ So, number of sets =  $\frac{2C}{2} = C$

$K$ th block map to  $(K \% C)$  set



Q. More than one word are put in one block to exploit spatial locality in a program.

Q.  $CS = 4K$  words,  $BS = 64$  words, set size = 4 blocks

The no. of bits in 'set' and 'word' field of main are.

$$\rightarrow \text{No. of bits in } \text{word} = 6 \quad (\log_2 BS)$$

$$\text{No. of bits in set} = \log_2 \left( \frac{CS}{BS} \right) = 4$$

Q. 4 way set associative, cache lines = 128,

line size = 64 words, PA = 20 bits

Tag, set and word fields are ?

