**3- Set-Associative Mapping**: In the set-associative mapping technique, the cache is divided into a number of sets. Each set consists of a number of blocks. A given main memory block maps to a specific cache set based on the equation s = i mod S, where S is the number of sets in the cache, i is

the main memory block number, and s is the specific cache set to which block i maps.

However, an incoming block maps to any block in the assigned cache set. Therefore, the address issued by the processor is divided into three distinct fields. These are the ***Tag****,* ***Set*,** and ***Word*** fields.



The length, in bits, of each of the fields of is given by:

1. **Word** field = log2 B, where B is the size of the block in words

2. **Set** field = log2 S, where S is the number of sets in the cache

3. **Tag** field = log2 (M/S), where M is the size of the main memory in blocks.

S = N/Bs, where N is the number of cache blocks and Bs is the number of

blocks per set

4. The **number of bits in the main memory address** = log2 (B x M)

**Example 4**: Compute the above three parameters (Word, Set, and Tag) for a memory system having the following specification: size of the main memory is **4K** blocks, size of the cache is **128** blocks, and the block size is **16** words.

Assume that the system uses set-associative mapping with **four** blocks per set.

S = 128/4 = 32 sets:

1. Word field = log2 B = log2 16 = log2 24 = 4 bits

2. Set field = log2 32 = 5 bits

3. Tag field = log2 (4 x 210/32) = 7 bits

The number of bits in the main memory address = log2 (B x M) = log2

(24  x212) = 16 bits.