Computer
Architecture

Assignment No. 04

Instructor: **Sir.Junaid Akhtar**

Student Details	
Name	Bilal Sheikh
Reg No.	FA19-BCS-136
Section	C

write a note on cache mapping techniques?

Cache mapping techniques are strategies used in computer architecture to determine how data is stored and retrieved in a cache memory. The primary goal of these techniques is to optimize the cache performance by minimizing cache misses and reducing the access time to frequently used data. Three common cache mapping techniques are as follows:

Direct Mapping:
In direct mapping, each block of main memory can be mapped to only one specific cache location. The cache is divided into sets, and each set contains a fixed number of blocks. The main memory addresses are divided into two parts: the block offset and the index. The block offset determines the position of the data within the cache block, while the index determines which set in the cache the block will be mapped to. Direct mapping offers simplicity and low hardware complexity but has a higher chance of cache conflicts and cache misses.

Fully Associative Mapping:
In fully associative mapping, each block of main memory can be placed in any cache location. Unlike direct mapping, there are no specific restrictions on where a block can be stored in the cache. Fully associative mapping reduces the number of conflicts and cache misses compared to direct mapping. However, it requires additional hardware to search the entire cache for a matching address, which can increase access time and cost.

Set-Associative Mapping:
Set-associative mapping is a compromise between direct mapping and fully associative mapping. The cache is divided into multiple sets, and each set contains a fixed number of blocks. Each block in main memory can be mapped to any block within a specific set in the cache. The main memory address is divided into three parts: the block offset, the index, and the tag. The block offset determines the position of the data within the cache block, the index determines the set in the cache, and the tag identifies the specific block within the set. It requires less hardware complexity than fully associative mapping but provides better cache performance compared to direct mapping.