COMSATS University Islamabad, Lahore Campus

Quiz 4 – FALL 2024

Course Title:	Computer Organization & Architecture			Course Code:	CPE 343	Credit Hours:	4(3,1)
Course Instructor:	Dr. Muhammad Naeem Awais			Program Name:	BS Computer Engineering		
Semester:		Batch:	FA22	Section:		Time:	10 minutes
Date:	24th December, 2024				Maximum Marks:		10
Student's Name:					Registration Number:		

Question 1: [CLO4-PLO3-C3] **[10 Marks]**

The size of a 4-way set associative cache is 128 KB with a block size of 8 KB. Assume the physical address generated by the CPU is 0X 77BA46FF. Draw a block diagram of the mentioned cache and ***compute*** the address of the starting byte of the second word in the block of the second set. Assume the word size is 64 bits and Tag field is same as given in the address generated by the CPU.

4-way set associative cache:-

Cache size = 128 KB

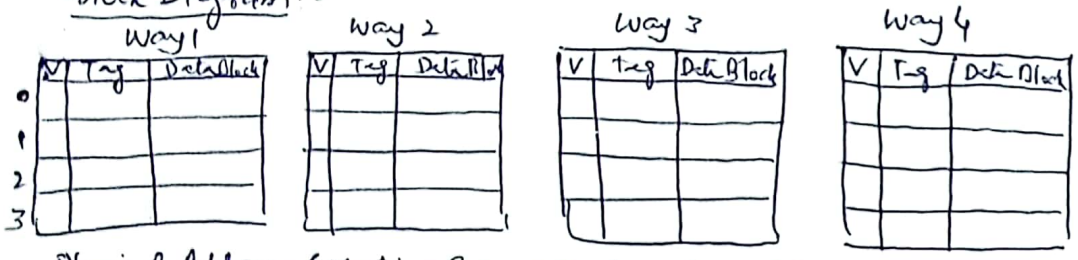
Block Size = 8 kB (13 bits are required for Block Offset field) i.e. $8k = 2^3 \cdot 2^{10} = 2^{13}$

Physical Address = 0X 77 B A 46 FF

C.S = Sets × Associativity × Block Size

$\Rightarrow$ Sets = $\frac{C.S}{A \times B} = \frac{128kB}{4 \times 8kB} = \frac{2^7}{2^2 \cdot 2^3} = 2^{7-5} = 2^2 = 4$ (2 bits are required for set index)

Block Diagram:-



Physical Address of starting Byte of the second Word (word size = 64 bits = 8 Bytes) & second Set:-

Physical Address = 0X 77 B A 46 FF, No. of bits required for set index = 2, 2nd set = 01

No. of bits required for Block Offset = 13, Starting Byte of 2nd word = 0000000001000

0111 0111 1011 1010 0100 0110 1111 1111

0111 0111 1011 1010 0 | 10 | 0 0110 1111 1111

17 bits (Tag) | 2 bits (set index) | 13 bits (Block Offset)

0111 0111 1011 1010 0	01	0000000001000