

8-way Set Associative Cache :-

Cache size = 128 Blocks

Block size = 4 words

Associativity = 8

No. of sets = $\frac{128}{8} = 16$ sets

	way1	way2	way3	way4	way5	way6	way7	way8
sets	V T D	V T D	V T D	V T D	V T D	V T D	V T D	V T D
0								
1	1 1 70 M							
2	1 0 11 M							
3								
4								
5		1 2 150 M						
6	1 0 25 M	1 1 88 M	1 1 90 M					
7	1 3 22 M							
8								
9	1 9 103 M	1 1 101 M	1 1 106 M					
10	1 2 170 M	1 0 63 M						
11								
12	1 1 113 M							
13								
14	1 1 123 M	0 56 M						
15	1 0 60 M	1 0 63 M						

Word Address	Main Memory Block	Cache set	Tag value
25	$25/4 = 6$	$6 \text{ MOD } 16 = 6$	$6/16 = 0$
170	$170/4 = 42$	$42 \text{ MOD } 16 = 10$	$42/16 = 2$
222	$222/4 = 55$	$55 \text{ MOD } 16 = 7$	$55/16 = 3$
103	$103/4 = 25$	$25 \text{ MOD } 16 = 9$	$25/16 = 1$
60	$60/4 = 15$	$15 \text{ MOD } 16 = 15$	$15/16 = 0$
106	$106/4 = 26$	$26 \text{ MOD } 16 = 10$	$26/16 = 1$
63	$63/4 = 15$	$15 \text{ MOD } 16 = 15$	$15/16 = 0$
113	$113/4 = 28$	$28 \text{ MOD } 16 = 12$	$28/16 = 1$
101	$101/4 = 25$	$25 \text{ MOD } 16 = 9$	$25/16 = 1$
123	$123/4 = 30$	$30 \text{ MOD } 16 = 14$	$30/16 = 1$
150	$150/4 = 37$	$37 \text{ MOD } 16 = 5$	$37/16 = 2$
11	$11/4 = 2$	$2 \text{ MOD } 16 = 2$	$2/16 = 0$
56	$56/4 = 14$	$14 \text{ MOD } 16 = 14$	$14/16 = 0$
70	$70/4 = 17$	$17 \text{ MOD } 16 = 1$	$17/16 = 1$
88	$88/4 = 22$	$22 \text{ MOD } 16 = 6$	$22/16 = 1$
90	$90/4 = 22$	$22 \text{ MOD } 16 = 6$	$22/16 = 1$
43	$43/4 = 10$	$10 \text{ MOD } 16 = 10$	$10/16 = 0$

Total number of words in a Block = 4 words

miss penalty = $15 \text{ ns} \times 1 + 1 \text{ ns} \times 3 = 18 \text{ ns}$

hit rate = 80%, miss rate = $100 - 80 = 20\%$

hit rate = 5 ns

AMAT = $ht + mr \times mp = 5 \text{ ns} + 0.20 \times 18 \text{ ns} = 5 + 3.6 = 8.6 \text{ ns}$