

Question 1:

No.	Cache Size (KB)	N way cache	Word size in bits	Block size	No. of sets	Tag size in bits	Index size in bits	Word block offset size in bits	Byte offset size in bits	Block Replacement Policy needed (N:no, Y:yes)
1	128	1	32	4	2^{13}	15	13	2	2	N
2	128	2	32	4	2^{12}	16	12	2	2	Y
3	128	4	32	8	2^{10}	17	10	3	2	Y
4	128	Full	32	8	1	27	0	3	2	Y
9	256	1	16	4	2^{15}	14	15	2	1	N
10	256	2	16	4	2^{14}	15	14	2	1	Y
11	256	4	16	16	2^{14}	16	11	4	1	Y
12	256	Full	16	16	1	27	0	4	1	Y

Question 2:

Memory Address (in Hex)	Set No.	Hit (Y:yes, N:no)
00 00 00 24	0	N
00 00 00 42	0	N
00 00 00 68	1	N
00 00 00 04	0	N
00 00 00 0C	1	N
00 00 00 4C	1	N

Question 3:

Memory Address (in Hex)	Set No.	Hit (Y:yes, N:no)
00 00 00 2C	1	N
00 00 00 48	1	N
00 00 00 44	0	N
00 00 00 0C	1	N
00 00 00 04	0	N
00 00 00 0C	1	Y

Question 4:

$AMAT = T_{L1} + MISS_{L1} \times (T_{L2} + MISS_{L2} \times T_{MM}) \rightarrow 1 + 0.20 \times (2 + 0.05 \times 20) = 1.6$
clock cycles

4 GHZ = 0.25 ns

$$10^{12} \times 0.25 \times 0.25 \times 10^{-9} \times 1.6 = 400$$

10^{12} instructions require 400 seconds to complete.