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22103277 Section Lab 6 Report
Question 1:

No.	Cache Size KB	N way cache	Word Size in bits	Block size (no. of words)	No. of Sets	Tag Size in bits	Index Size (Set No.) in bits	Word Block Offset Size in bits[1]	Byte Offset Size in bits[2]	Block Replacement Policy Needed (Yes/No)
1	128	1	32	4	2^13	15	13	2	2	No
2	128	4	32	16	2^9	17	9	4	2	Yes
3	128		32	16	1	26	0	4	2	Yes
4	256	2	64	8	2^11	15	11	3	3	Yes
5	256	4	64	32	2^8	16	8	5	3	Yes
6	256		16	16	1	27	0	4	1	Yes

Question 2:

Memory Address Accessed (hex)	**Set No.**	**Hit(yes/no)**
00 00 20 24	00	No
00 00 20 42	00	No
00 00 20 68	01	No
00 00 20 04	00	No
00 00 20 0C	01	No
00 00 20 4C	00	No

Question 3:

Memory Address Accessed (hex)	**Set No.**	**Hit(yes/no)**
00 00 00 2C	01	No
00 00 00 48	01	No
00 00 00 44	00	No
00 00 00 0C	01	No
00 00 00 04	00	No
00 00 00 0C	01	Yes

Question 4:

Part a:

The physical address size is 32 bits.
The tag size is 25 bits.
The index size is 1 bit.
The block offset size is 5 bits (since we have 32 words per block)
The byte offset size is 1 bit (since the word size is 2 bytes).

Part b:

The data area size is 32 words×16 bits per word=512 bits
Including the tag and the dirty bit, the total block size is 512+25+1=538 bits

Part c:

The size of a set, with 8 blocks per set, is
538 bits per block×8 blocks per set=4304 bits

The total SRAM size, with the number of sets calculated, is
4304 bits per set×2 sets=8608 bits

Part d:

If random replacement is used instead of LRU, the total SRAM size would be reduced by the number of bits used for LRU tracking. In this case, since LRU tracking typically requires

$\log_2(8)=3$ bits per block, and there are 8 blocks per set and 2 sets in total, we would save

$3 \text{ bits per block} \times 8 \text{ blocks per set} \times 2 \text{ sets} = 48 \text{ bits}$

Therefore, using random replacement would reduce the total SRAM size by 48 bits compared to using LRU.