

## Week 9 Assignment

Student name(s):

1. (50 points) The following table gives the parameters for a number of different caches. Your task is to fill in the missing fields in the table. The definitions of the cache memory parameters are as follows:

- $m$ : the number of address bits
- $C$ : the cache size (number of data bytes)
- $B$ : the block size in bytes
- $E$ : the associativity
- $S$ : the number of cache sets
- $t$ : the number of tag bits
- $s$ : the number of set index bits
- $b$ : the number of block offset bits

Cache	$m$	$C$	$B$	$E$	$S$	$t$	$s$	$b$
1.	32	4096	8	-----	512	20	-----	3
2.	48	-----	-----	2	256	-----	8	4
3.	32	1024	32	1	-----	22	5	-----
4.	-----	2048	16	4	32	23	-----	-----

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2. (50 points) Suppose we have a system with the following properties:

- The memory is byte addressable, and the addresses are 12-bits wide.
- The cache is two-way associative ( $E = 2$ ), with 4-byte blocks ( $B = 4$ ) and four sets ( $S = 4$ ).

The contents of the cache are as follows, with all addresses, tags, and values given in hexadecimal notations:

Set index	Tag	Valid	Byte 0	Byte 1	Byte 2	Byte 3
0	00	0	20	21	22	23
	11	1	28	29	2A	2B
1	44	1	60	61	62	63
	55	0	68	69	6A	6B
2	77	0	90	91	92	93
	88	0	98	99	9A	9B
3	BB	1	D0	D1	D2	D3
	CC	1	D8	D9	DA	DB

For each of the following memory accesses, indicate if it will be a cache hit or miss when *carried out in sequence* as listed. Also, give the values of a read if it can be inferred from the information in the cache.

Operation	Address	Hit?	Read value (or unknown)
Read	0x111	-----	-----
Read	0x222	-----	-----
Read	0x444	-----	-----
Read	0x888	-----	-----
Read	0xBBB	-----	-----