Coursework 2

Joseph Mulray
COMP1211
November 23, 2017

1 (a) How many bytes in total can be stored in the cache?

Block size is 32 bytes = 2^4 = 4 bits

Lines is 32 bytes = 2^4 = 4 bits

Cache size = 2^4 x 2^4 = 2^8 = 256 bytes

256 bytes

(b) Describe how the memory address is divided into tag, line number and byte number, giving the number of bits for each.

Block size is 32 bytes = 2^4 = 4 bits

Lines is 32 bytes = 2^4 = 4 bits

Main memory = 2Mbytes = 2^{21}

Main memory can store 2^{21} bytes, so it requires a 21-bit address

Tag is $21 - (4 + 4)$ = 13 bits

Tag	Line	Word
13 bits	4 bits	4 bits

(c) Into which lines would bytes with each of the following addresses be stored

Line numbers:

(a) 13

(b) 3

(c) 13

(d) 10

(d) What other bytes are stored along with it in the same cache line?

0000110000011 0001 0000 through 0000110000011 0001 1111 are stored in that line.

2. Describe how a main memory address is divided into tag, set number and byte number, giving the number of bits for each.

Main memory is 4Mbytes = 2^2 x 2^{22} = 2^{24}

24bit memory address

Cache is 64Kbytes = 2^6 x 2^{10} = 2^{16}

Block Size is 16bytes = 2^4

Lines = 2^{16} / 2^4 = 2^{12}

Block Set (K) = 2

Since the blockset is 2 we reduce the Lines by half by removing one bit from Lines and moving it into tag leaving 11 bits to identify the Set and 7 bits to identify the Tag.

Tag	Set	Word
7 bits	11 bits	4 bits

3. Show the resulting changes to the values held in registers (PC, AC and IR) and memory when a computation is started with a value of 100 in the PC, and the following values held in memory:

PC	IR	AC	520	521	522
100	4520	0120			
101	8522	0127			
102	6521			0127	