Samuel Scalf
CMIS 310
Dr. Yul Williams

(2) a) $\frac{2^{32}\text{ words}}{2^5\text{ words/block}} = 2^{32-5}\text{ blocks} = 2^{27}\text{ blocks}$

b) Block Index = 27 bits
Cache Index: $1024 = 2^{10} \rightarrow$ 10 bits
Tag Size = 17 bits
Blk Offset = 5 bits (2^5 words/block)

Tag 17 bits	Block 10 bits	Word 5 bits

c) $00006\text{3FA}_{16} \rightarrow 00\cdots0\,|\,1\,1\,0\,0\,0\,|\,1\,1\,1\,1\,1\,|\,1\,0\,1\,0$
BLOCK | WORD

$512+256+16+8+4+2+1 = 799_{10}$ ∴ Cache Block 799

(4) a) $\frac{2^{24}\text{ words}}{2^6\text{ words/block}} = 2^{24-6}\text{ blocks} = 2^{18}\text{ blocks}$

b) WORD/BLOCK OFFSET = 6 bits
PA = 24 bits
TAG = 24 − 6 = 18 bits

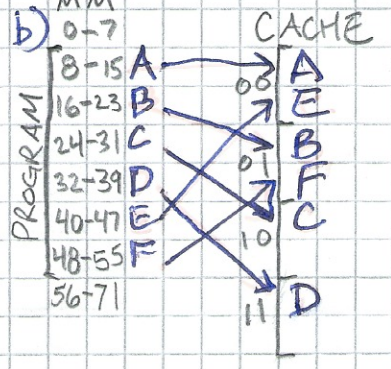
TAG 18 bits	WORD 6 BITS

c) Trick Question. It's fully associative, so it could map to any block.

(6) a) Main Memory = 2K × 8 = $2^1 \times 2^{10} \times 2^3 = 2^{14}$ words and 14-bit Addresses
4 sets requires 2 bits (00, 01, 10, 11).
8 words/block requires 3 bits.
Tag = 14 − 2 − 3 = 9 bits

TAG 9 BITS	SET 2 BITS	WORD 3 BITS

b)



1) 8 Miss, Block → Set 00
2) 9-15 Hit (7 Hits)
3) 16 Miss, Block → Set 01
4) 17-23 Hit (7 Hits)
5) 24 Miss, Block → Set 10
6) 25-31 Hit (7 hits)
7) 32 Miss, Block → Set 11
8) 33-39 Hit (7 hits)
9) 40 Miss, Block → Set 00
10) 41-47 Hit (7 hits)
11) 48 Miss, Block → Set 01
12) 49-55 Hit (3 hits)

1ST: 6 Miss; 5×7+3 = 38 Hits
2ND: 6×8+4 = 44 Hits
3RD: 6×8+4 = 44 Hits
Total: 6 Miss, 126 Hits

Hit Ratio = $\frac{126}{132} \approx 95.\overline{45}\%$

(8) a) MM = 2^{21} words = 21-bit Address
Cache = 2^6 blocks / 2 blocks/set = 2^5 sets = 5 set bits
Word = 2^2 words/block = 2 word bits
Tag = 21 − 5 − 2 = 14 bits

Tag 14 bits	Set 5 bits	Word 2 bits

b) MM and Word are same as part a.
Cache = 2^6 blocks / 2^2 blocks/set = 2^4 sets = 4 set bits

Tag 15 bits	Set 4 bits	Word 2 bits

(12)