0907432 Computer Design (Summer 2015)

Quiz 2

الاسم: رقم التسجيل: الرقم التسلسلي:

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Instructions: Time **20** minutes. Open book and notes exam. No electronics. Please answer all problems in the space provided and limit your answer to the space provided. **No questions are allowed**.

<Good Luck>

Assume that you have a primary 2-way associative cache that has 8 sets.

[Every question 2 marks]

A) What is the size of this cache if the block size is 16 bytes?

Cache size = No. of sets × Associativity × Block size

= 8 × 2 × 16 = 256 bytes

B) What is the tag width if the address width is 32 bits?

<tag> = 32 - <index> - <block offset>

= 32 - $\lg_2$ (8) - $\lg_2$ (16)

= 32 - 3 - 4 = 25 bits

C) In what set the word of address 12345678_{16} is cached?

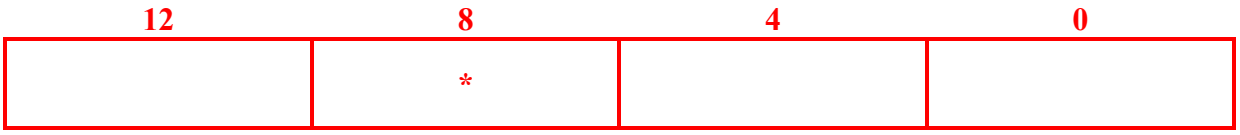
Block address = ⌊ Address / Block size ⌋

= ⌊ 12345678_{16} / 16 ⌋ = 1234567_{16}

Index = Bock address mod No of sets

= 1234567_{16} mod 8 = 7

D) Draw one block of this cache and show where the word of address 12345678_{16} is cached?



E) What is the average access time of this cache if it has an 80% hit rate, has a 1-cycle hit time, and the average time needed to satisfy a miss from the lower memory levels is 30 cycles?

Average access time = Hit time + Miss rate × Miss penalty

= 1 + 0.2 × 30 = 1 + 6 = 7 cycles