

CS 60B Midterm #1 — February 17, 1993

Your name _____

login c60b-_____

Discussion section number _____

TA's name _____

This exam is worth 15 points, or 15% of your total course grade. The exam contains five substantive questions, plus the following:

Question 0 (1 point): Fill out this front page correctly and put your name and login correctly at the top of each of the following pages.

This booklet contains four numbered pages including the cover page. Put all answers on these pages, please; don't hand in stray pieces of paper. This is an open book exam.

When writing procedures, write straightforward code. Do not try to make your program slightly more efficient at the cost of making it impossible to read and understand.

When writing procedures, don't put in error checks. Assume that you will be given arguments of the correct type.

Our expectation is that many of you will not complete one or two of these questions. If you find one question especially difficult, leave it for later; start with the ones you find easier.

0	/1
1	/2
2	/1
3	/3
4	/4
5	/4
total	/15

Question 1 (2 points):

Convert the 16-bit hexadecimal value `0xff3a` into (a) binary and (b) signed decimal representations.

Question 2 (1 point):

Scientific computers of the 1960s used a 36-bit word, which could hold six 6-bit characters. If the character set includes the 26 capital letters A–Z and the ten digits 0–9, how many punctuation characters could also be represented?

Question 3 (3 points):

The MIPS assembler includes pseudo-instructions that are implemented using actual machine instructions. For example, in lecture you learned that `MOVE` is implemented using `ADD`. Show how each of the following pseudo-instructions could be implemented using instructions from figure 3.13 on page 131 of P&H.

(a) `ZERO addr` (stores the value 0 into word `addr` of memory)

(b) `NEG rd,rs` (sets register `rd` to the negative of the value in `rs`)

(c) `INC addr` (stores into word `addr` in memory a value 1 greater than its original value)

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Question 4 (4 points):

Write a C function `dotproduct` that takes three arguments: two arrays of floating-point numbers (`floats`) and an integer representing the length of the arrays. It should return a single floating-point number, which is the sum of the products of corresponding elements, i.e.,

$$a[0] * b[0] + a[1] * b[1] + \dots + a[\text{length}-1] * b[\text{length}-1]$$

where `a` and `b` are the arrays.

Question 5 (4 points):

Write a C function named `stuck_key` that takes a character string as its argument. It should return an integer, representing the length of the longest substring of identical consecutive characters. For example,

```
stuck_key("alabbbastterattala")
```

should return 3 because of the three consecutive `b` characters.