CMPS-112 · Programming Languages · Winter 2012 · Test #1 page 1 of 1

$Id: cmps112-2012q1-exam1.mm,v 1.17 2012-02-03 19:00:34-08 - - $

.PS

examboxes(3)

.PE

No books; No calculator; No computer; No email; No internet; No

notes; No phone. Neatness counts! Do your scratch work elsewhere

and enter only your final answer into the spaces provided.

.EQ

delim $$

.EN

1. Define a function grep in Scheme whose first argument is a

predicate and second argument a list. It returns a new list of

all of the elements of the argument list for which the predicate

is true. Do not use a higher-order function. [2pt]

2. Define a function positives which uses grep (above) to accept a

list of numbers and return only the positive ones. Use a lambda

expression, not a function name, as one of its arguments. [1pt]

3. Define a function sum which returns the sum of all elements of a

list. Do not use any higher-order functions. Use constant ($ O (

1 ) $) stack space. [2pt]

4. Define the same function sum using the higher-order function

foldleft, whose arguments are a unit value, a binary function, and

a list. [1pt]

5. Name the two kinds of universal polymorphism and give an example

of each. [2pt]

6. Name the two kinds of ad hoc polymorphism and give an example of

each. [2pt]

7. Write a complete program in Perl that reads in words from all of

the filenames specified in @ARGV, and after end of file of the

last file, prints out each word, one per line, sorted

lexicographically, with each word followed by a count of the

number of times it occurred. Exit status is 0 for success and 1

if any file could not be opened. Print suitable error messaages

for files that could not be opened. If no files are specified,

read the standard input. Do not use the <> operator. Use /\w+/

to match words or /\W+/ to split delimiters. If @ARGV is empty,

use "-" (standard input). [5pt]

#!/usr/bin/perl

use strict;

use warnings;

$0 =~ s|.\*/||;

8. Define the function zip in Scheme. It takes a function and a pair

of lists and returns a list having pairwise applied the function

to corresponding pairs of elements in the list. If the lists are

of unequal length, the function stops when the shorter list runs

out. [2pt]

Example: (zip + '(1 2 3) '(4 5 6 7))

Returns: (5 7 9)

9. Define the same function in Perl. It takes a reference to a

function of two arguments, followed by references to two arrays

and applies the function pairwise to the arrays, returning an

array of the shorter length. [2pt]

Example: @y = zip sub{$\_[0]+$\_[1]}, [1, 2, 3], [4, 5, 6, 7];

print "@y\n";

Prints: 5 7 9

10. Write a program in Perl which prints out all of the command line

arguments (but not the program name) on one line, each separated

from the next with one space, but does not print a space in the

front or at the end. It finishes by printing a newline character.

[1pt]

#!/usr/bin/perl

Multiple choice. To the left of each question, write the letter that

indicates your answer. Write Z if you don't want to risk a wrong

answer. Wrong answers are worth negative points. [11pt]

+--------------------------+------+------+------------+

|number of | |× 1 = | $= a$ |

|correct answers | | | |

+--------------------------+------+------+------------+

|number of | |× ½ = | $= b$ |

|wrong answers | | | |

+--------------------------+------+------+------------+

|number of | |× 0 = | 0 |

|missing answers | | | |

+--------------------------+------+------+------------+

|column total | 11 | | $= c$ |

|$ c = max ( a - b , 0 ) $ | | | |

+--------------------------+------+------+------------+

1. Which of these languages evaluates expressions in a lazy manner by

default?

(A) Haskell

(B) Lisp

(C) Perl

(D) Scheme

2. Which of the following C operators is ``lazy''?

(A) &&

(B) ++

(C) ==

(D) >>

3. What is the running time of the following function?

(define (f n)

(if (< n 2) n

(+ (f (- n 1)) (f (- n 2)))))

(A) $ O ( n ) $

(B) $ O ( log sub 2 n ) $

(C) $ O ( n sup 2 ) $

(D) $ O ( 2 sup n ) $

4. What amount of stack space is taken up by evaluating that same

function?

(A) $ O ( n ) $

(B) $ O ( log sub 2 n ) $

(C) $ O ( n sup 2 ) $

(D) $ O ( 2 sup n ) $

5. What is the value of:

(cadr '((1 2 3) (4 5 6) (7 8 9)))

(A) 1

(B) (4 5 6)

(C) (2 3)

(D) ((7 8 9))

6. In C, when is a static local variable bound to a particular

virtual address?

(A) When the program is compiled.

(B) When the program is linked.

(C) When the program is loaded into execution by the exec system

call.

(D) When the function in which it is declared is called.

7. Data types in Perl and Scheme are:

(A) strong and dynamic.

(B) strong and static.

(C) weak and dynamic.

(D) weak and static.

8. A static link in a stack frame points at:

(A) the address of the call instruction that activated this

function.

(B) the stack frame of the calling function.

(C) the stack frame of the function in which this function is

nested.

(D) the top of the function call stack.

9. Assuming only pure Java code with no sneaky tricks written in C,

If M = memory leaks, D = dangling references, and U = unsafe type

conversions or casting, which of the following are possible in

Java?

(A) all of them.

(B) none of them.

(C) only D, but neither M nor U.

(D) only M, but neither D nor U.

10. Given the C declaration char \*\*p;, which expression is invalid?

(A) &(&p)

(B) &(\*p)

(C) \*(&p)

(D) \*(\*p)

11. John Backus, 1953, IBM 704.

(A) ALGOL

(B) COBOL

(C) FORTRAN

(D) LISP