

# Midterm Examination

## CSC315 Programming Language Concepts

11 October 2013

1. Give examples of programming languages whose origins can be traced to:
  - (a) efforts by a corporation to develop a product
  - (b) research by professors working at a university
  - (c) a request from a public agency
2. Give examples of languages that were developed...
  - (a) for use in education
  - (b) for use in the solution of scientific and engineering problems
  - (c) for use in business
3. Describe the relationship between the imperative paradigm and the von Neumann architecture.
4. We referred to the DEC VAX during our discussion of orthogonality. What is the DEC VAX?
5. Engineers seldom see problems with perfect solutions. Almost always they face competing demands. Making a product better in one way means compromising on some other goal, and so engineers have to seek a balance. Review the attributes of a well-designed programming language. Find a case in which too much emphasis on one attribute could reduce the quality of the language's design in some other respect.
6. Describe as clearly and concisely as you can the algorithm that I have used in the following function.

```
;; exponent should be a non-negative integer
(define (pow base exponent)
  (if (equal? exponent 0)
      1
      (let ((smaller-power (pow base (quotient exponent 2))))
        (if (even? exponent)
            (* smaller-power smaller-power)
            (* base smaller-power smaller-power)))))
```

7. Explain what the phrase “precedence of operators” means using the following two possible interpretations of  $3 + 4 \cdot 5$  as an example.

$$\begin{aligned} 3 + 4 \cdot 5 &= (3 + 4) \cdot 5 \\ &= 7 \cdot 5 \\ &= 35 \\ 3 + 4 \cdot 5 &= 3 + (4 \cdot 5) \\ &= 3 + 20 \\ &= 23 \end{aligned}$$

8. Explain what the phrase “associativity of operators” means using the following two possible interpretations of  $2^{4^2}$  as an example.

$$\begin{aligned} 2^{4^2} &= (2^4)^2 \\ &= 16^2 \\ &= 256 \\ 2^{4^2} &= 2^{(4^2)} \\ &= 2^{16} \\ &= 65536 \end{aligned}$$

9. List the steps needed to make a program ready for execution.
10. Identify the principal parts of a compiler.
11. Look on the Web for information about Ratfor. Summarize what you learn in a paragraph.
12. Look on the Web for quotations from Edsger Dijkstra. Select a comment by Dijkstra about our subject. Do you agree? Why?
13. Identify three methods of describing the semantics of programming language. Very briefly, what does Robert Sebesta, the author of our textbook, think about the usefulness of these methods?
14. Distinguish between dynamic and static scoping.
15. Identify a difference between the use of constants in Java and in C#.
16. What is the heap?
17. Write a regular expression for the Emacs text editor that will match “Ruby,” “Scala,” or “Scheme.” Look on the Web for help.