

# Principles of Programming Languages - Quiz I

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## 1 Instructions

1. Each question is worth 3 points.
2. Attempt as many problems as you can. You will be given partial credit, as per the policy discussed in class.

## 2 Problems

1. Explain with an example (in **C**), the differences between parameter passing by value and parameter passing by reference.
2. Briefly explain the themes of imperative programming, functional programming and logic programming.
3. What are the different types of errors that can occur in a program? Give one example of each.
4. Let  $\Sigma = \{0, 1\}$  denote an alphabet and let  $L \subseteq \Sigma^*$  denote the language which is composed of strings that start with a 0 and end with a 1. For instance, the strings  $\{01, 011101, 0111\}$  belong to  $L$ , while the strings  $\{\epsilon, 1, 10, 111\}$ , do not belong to  $L$ . Write a regular expression for  $L$ .
5. Let  $\Sigma = \{0, 1\}$  denote an alphabet and let  $L \subseteq \Sigma^*$  denote the language represented by the following Context-Free Grammar:

$$\begin{aligned} S &\rightarrow A1B \\ A &\rightarrow 0A \mid \epsilon \\ B &\rightarrow 0B \mid 1B \mid \epsilon \end{aligned}$$

Show that the string 1001 belongs to  $L$ , by providing a derivation.