

# CIIC4030/ICOM4036: Programming Languages

University of Puerto Rico at Mayaguez

## Assignment 1

1. Describe the languages denoted by the following regular expressions
  - (a)  $\mathbf{a(a|b)^*a}$
  - (b)  $\mathbf{a^*ba^*ba^*ba^*}$
2. Construct a Deterministic Finite Automation (DFA) for each of the languages described in Problem 1.
3. Write regular definitions for the following languages
  - (a) All strings of lowercase letters that contain the five vowels in order.
  - (b) All strings of **a's** and **b's** that do not contain the substring **abb**
4. Consider the following context-free grammar

$$S \rightarrow SS+ \mid SS* \mid \mathbf{a}$$

- (a) Show how the string  $\mathbf{aa+a^*}$  can be generated by this grammar
  - (b) What language does this grammar generate? Explain.
5. Construct a recursive-descent parser for the following grammar

$$S \rightarrow S(S)S \mid \epsilon$$