Topics for Midterm

- Introduction and Language Evaluation
- History and Evolution
- Name, Scope, and Binding
  - Variables
  - Binding - Type bindings, Type Checking, type conversion
  - Storage bindings
  - Scope, lifetime
  - Referencing Environments

- Expression Evaluation and Control Flow
  - Operator/ Operand evaluation order, Overloaded operators
  - Type conversions
  - Short-circuit evaluation of conditions
  - Control structures

- Programming Language Syntax
  - concepts, regular expression, context-free grammars
  - Lexical analysis – Scanner
  - Syntactic analysis – Parser
- Programming Language Semantics
  - Static Semantics, attribute grammar

Consider the following grammar:

<S> → <A> a <B> b
<A> → <A> b | b
<B> → a <B> | a

Which of the following sentences are in the language generated by this grammar?

a. baab
b. bbbab
c. bbaaaaa
d. bbaab

$S \rightarrow A\ a\ B\ b$

$A \rightarrow A\ b\ |\ b$

$B \rightarrow a\ B\ |\ a$

Sentences generated by the grammar?

$$S \rightarrow A \ B \ C$$

$$A \rightarrow a \ A \mid a$$

$$B \rightarrow b \ B \mid b$$

$$C \rightarrow c \ C \mid c$$

Sentences generated by the grammar?

Consider the following grammar:

<S> → a <S> c <B> | <A> | b
<A> → c <A> | c
<B> → d | <A>

Which of the following sentences are in the language generated by this grammar?

a.   abcd
b.   acccbd
c.   acccbcc
d.   acd
e.   accc

LL Grammar - Example

Rewrite the grammar by eliminating left recursion.

$E \rightarrow E + T \mid T$

$T \rightarrow T * F \mid F$

$F \rightarrow (E) \mid id$