Georgia State University
Department of Computer Science

CSC4330/6330 – Assignment #2
Summer 2017
Due Thursday June 22nd, 11:59 pm

All answers must be computer-printed, except for diagrams. Use your own words; do not copy material verbatim from a web site or other source.

1. Using the grammar in Example 3.4, show a parse tree and a leftmost derivation for the following statement:

   A = A + (B * C)

2. The following BNF grammar gives a (slightly simplified) syntax for enumeration declarations in the D programming language:

   <enum_decl> → enum <identifier> { <enum_members> }
   | enum { <enum_members> }
   | enum <identifier>
   <enum_members> → <enum_member>
   | <enum_member> ,
   | <enum_member> , <enum_members>
   <enum_member> → <identifier>
   <identifier> → a | b | c

   Using this grammar, give a parse tree and a leftmost derivation for the following sentence:
   enum {a, b, c,}

3. Convert the following EBNF rule into ordinary BNF.
   S → A{bA}
   A → a[b]A

4. Modify the attribute grammar of Example 3.6 in Sebesta so that it uses only a single (synthesized) attribute.

5. 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 rammar?
   a. baab
   b. bbbab
   c. bbaaaaa
   d. bbaab

6. Convert the BNF of Example 3.3 to EBNF.

7. (a) What is the weakest precondition needed to prove the correctness of the following loop?

```
while i < j do
  i = i + 1;
  j = j - 1;
end
{i = j or i = j + 1}
```

(b) Give an invariant that is strong enough to prove the correctness of the loop.

Submission Instructions:

- **Make sure to justify all answers – show all work.**
- The Assignment must be submitted electronically through ICollege/D2L.
- Upload the answers in a pdf file to ICollege/D2L in the respective assignment dropbox.
- All work must be neat and legible. Illegible work will receive no credit. This includes work where the print contrast or darkness are too faint
- The work that you turn in must be your own --- copying is not allowed for any assignments.
- Using another student's work as your own, allowing another student to use your work as their own, is academic misconduct and is not tolerated.