CSCI350
Structure of Programming Language
Final Exam

Name: _____

Graduating Senior ? Yes

No

1. 1. Fill in blanks. (30pts)

   1) (10pts) An ___array___ is an aggregate of data of the same data type.

   2) (10pts) The 3 examples of primitive data types are: ___int___, ___float___, ___char___.

   3) (10pts) In the actual/formal parameter correspondence, ___keyword___ is the binding of actual parameters to formal parameters by name, ___positional___ is the binding of actual parameters to formal parameters by position.

2. Answer following questions. (20pts)

   1) (10pts) What is the language described by the Regular Expression (a|b|c)* ?

      Set of strings of 0 or more a's, b's and c's

   2) (10pts) In parameter passing, what is the difference between pass-by-value and pass-by-reference?

      Pass by value passes the actual value. This differs from pass by reference, where the address of the variable is passed, not the actual value.

   3) (10pts) Please Perform the pairwise disjointness test for the following grammar rules.

B → aB | bA | aBb

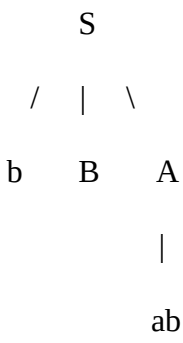
FIRST(B) = {a}, {b}, {a}
This does not pass the pairwise disjointness test. The FIRST sets for the RHSs in the B rules are {a}, {b} and {a}, which are not disjoint.

3. (20pts) Given the following grammar and its right sentential form of ***bBab***, draw a parse tree and show the phrases and simple phrases, as well as the handle.

S → aAb | bBA

A → ab | aAB

B → aB | b



Phrases: bBab, ab

Simple Phrases: ab

Handle: ab

4. (20pts) Consider the following C program:

```
int fun(int *i) {
 *i *= 5;
 return 10;
}

void main() {
   int x = 5;
   x = x + fun(&x);
   }
```

What is the value of `x` after the assignment statement in main, assuming

a. operands are evaluated left to right.

15

b. operands are evaluated right to left.

35

5. (20pts) Given the following grammar

$S \rightarrow B\ c \mid D\ B$

$B \rightarrow a\ b \mid c\ S$

$D \rightarrow d \mid \varepsilon$

Please calculate FIRST(X) for each X in the first column in the table below and fill out the table:

X	FIRST(X)
DB	{d}, {**ε**}, {a}, {c}
ab	{a}
cS	{c}
ε	{**ε**}

Extra Credit:

1. (10pts) Please write an unambiguous context free grammar (CFG) for the following language. (10pts):

   {All strings consisting of balanced parenthesis and/or brackets}

   S -> (S)S | [S]S | **ε**