62: 460 Concepts Programming Languages
Winter 2024
Assignment 3 – Points 20

Due Date: **Wednesday, April 03, 2024, 11:59pm**

1. Introduction

This assignment is meant to test your learning and practical skill development on how expression and assignment statements are designed in various programming languages and what are their impacts of respective design choices. In Section 2, you are presented with a code segment implementing a function that has side effects. You must rewrite the program in three different programming languages, i.e., C, Java, and Golang. Then you have to analyse the program outputs. Finally, you have to compare the design of these programming languages in terms of the order of operator evaluations in assignment statements.

2. The **mystery** function and its use in **assignment statements**

Let the function `mystery` be defined as:

```
int mystery (int* k) {
*k += 5;
return 3 * (*k) - 1;
}
```

Suppose `mystery` is used in a program as follows:

```
void main () {
int i = 20, j = 20, sum1, sum2;
sum1 = (i / 2) + mystery(&i);
sum2 = mystery(&j) + (j / 2);
}
```

3. Questions **[Points 20]**

a) Determine the values of `sum1` and `sum2` when:
   (i) operands in the expressions are evaluated left-to-right. [**Points 01**]
   (ii) operands in the expressions are evaluated right-to-left. [**Points 01**]

b) Complete the code given in Section 2 in C Programming Language and run it. Then, give the values of `sum1` and `sum2`. Explain the results. [**Points 03**]

c) Rewrite the program of Question (b) in Java and run. Explain the results. [**Points 04**]

d) Rewrite the program of Question (b) in Golang and run. Explain the results. [**Points 04**]

e) Compare C, Java, and Golang programming language in terms of order of operator evaluation in assignment statements with respect to the experimental results that you obtained in Question (b), (c) and (d). [**Points 06**]
   Note: Explain the difference in design of these programming languages and the relative advantages and disadvantages.

f) Name the files appropriately as instructed in Section 5(b)(i) and 5(b)(ii) [**Points 01**]

4. Resources

a) Expression and Assignment Statements:
   - Chapter 6 and Chapter 7 of the textbook titled "Concepts of Programming Languages" by R. W. Sebesta.

b) Golang
   - Installation guide: https://go.dev/doc/tutorial/getting-started
   - Web tutorial: www.gobyexample.com
   - Book: "*Go Programming Language for dummies*"

c) C Programming language
   - Basic tutorials for C: https://www.w3schools.com/c/index.php

5. Deadline and Submission

a) Deadline: Wednesday, April 03, 2024, 11:59pm

b) Submission instructions:

(i) You must submit **four** files: i) Your completed assignment (pdf file); ii) A C-program (Q(b); iii) A Java Program (Q(c)); iv) A Golang program (Q(d)).

Name the files as, respectively, yourfirstname_assignment3.pdf, yourfirstname_mystery.c, yourfirstname_mystery.java, yourfirstname_mystery.go.

(ii) **Zip** all the four files as **yourFirstName_assignment3**, (e.g., rashed_assignment3).

(iii) Access the Moodle course website for this course (62:460). Find the **Assignments menu** (at the bottom of page), then find and click **Assignment 3** where you must **upload** your zipped file. Finally, click the **Submit** button by the due date to finalize your submission. You can save your work multiple times before you click the Submit button.

(iv) A software for **plagiarism** check will be applied on each submitted work. You may be called for an **interview** to validate the originality of the submitted work. Please get yourself familiar with BU's plagiarism policy.

6. Criteria for Evaluation

- The programs run without error.
- Timely submission
- Correctness and completeness of the program
- Proper file naming
- Proper indexing of the answers
- Clarity and novelty of your answers
- Instructor discretion