CSE 262: Quiz #2  
Due September 30th, 2022 at 11:59 PM

The quiz has TWO questions. Please submit your answer by updating this file in the quizzes folder of your Bitbucket account, and then committing and pushing. You should use as much space as you want for each answer. Please be detailed in your answers. Remember: this quiz is worth 9% of your grade, and you will not receive very many points if you do not give detailed answers.

**Question 1:** In software engineering classes, a popular topic is “patterns,” one of which is the “Singleton” pattern. What is the Singleton pattern? Please be detailed in your answer. Then describe (in text, possibly with some accompanying pseudocode) how you would implement the Singleton pattern in Scheme. (Hint: a function is not able to define new globals, so if you’re going in that direction, you’re probably not thinking about it correctly).

The Singleton pattern revolves around the idea of creating a single object of a single class that we want to use our Singleton pattern around and ensures that the single object is the only instance of the class that will be made. (I will refer to this single object as the Singleton object). This Singleton object that is created becomes a single source of information that is considered a share resource that many other components of a program can use without recreating that object. All the methods, states, and fields are available to all objects that are a reference to the Singleton object. Since there is only ever one instance of the object created, all the information that is manipulated or added by the references to the Singleton object is retained in the single object. In essence, the Singleton pattern uses a single object of a class to hold and use all the information of that class.

To do this, the single object is created within the class and declared static so that it belongs to the class, instead of instances of that class. Furthermore, its constructor is made private so that no other instances of the class could be made. The way to retrieve the single object is through the get method which returns the single object.

PSUEDOCODE:

class SingletonClass

// creating static SingletonClass obj so that it belongs to the class

public static SingletonClass obj = new SingletonClass()

// creating private constructor so that no other instances could be made

private SingletonClass ()

// getter method to get the Singleton object

public static SingletonClass getObj()

// return obj

return obj;

endClass

**Question 2:** In our discussion of semantic analysis, we talked about how it can be used to “check” a program (to find semantic errors or produce warnings for programs that are able to be parsed) and also to “transform” a program (typically to make it faster). There are quite a few examples of semantic analysis online and in the book. Study one analysis that falls into the “check” category, and one that falls into the “transform” category. For each, describe it in detail. (Note: if possible, please describe analyses that we did not discuss in depth in class; if that’s not possible, please be sure to go into more detail than what we discussed in class.)