CS F214
Logic in CS
BITS Pilani, Hyderabad Campus
Assignment -2
Due Date : 23rd November 2025 (by Midnight)
Total Marks: 30 (weightage : 10%)

Objective: The objective of this assignment is to introduce you to a programming language which allows code verification. You will learn the programming language Dafny (https://dafny.org/) , which enables code verification.

You can add Dafny extension in VS code (https://marketplace.visualstudio.com/items?itemName=dafny-lang.ide-vscode).

You will learn the following

1. How to write methods.
2. How to write preconditions and postconditions
3. How to write loop invariants
4. How to write loop variant

You can start learning Dafny starting with reading the document on this website.

https://share.google/raoNwTNWR1d1l7NQA

There may be some changes in the latest version of Dafny, which you can explore on the Dafny's website.

Task 1:
Write a method to compute the absolute value of an integer variable. The signature of the method is

method Abs(x: int) returns (x' : int)

Write appropriate precondition and postcondition to verify your code. **[4]**

Task 2:
Write a method to find the index of the first occurrence of a negative number in an array. The signature of the method is

method FindFirstNegative(a: array<int>) returns (index: int)

Write appropriate preconditions and postconditions to verify your code.
Also, write the loop invariant for partial correctness and the loop variant for total correctness. **[4]**

Task 3:
Write a method to compute the factorial of a positive integer. Write appropriate preconditions and postconditions to verify the correctness your code. Also, write the loop invariant for partial correctness and the loop variant for total correctness. **[8]**

Task 4:
Write a method to compute the nth term of the Tribonacci Sequence. The Tribonacci Sequence is defined as

$T_n = T_{n-1} + T_{n-2} + T_{n-3}$, where $T_0 = 0$, $T_1 = 1$, $T_2 = 1$.

Ensure that you write an iterative implementation. Write appropriate preconditions and postconditions to verify the correctness of your code. Also, write the loop invariant for partial correctness and the loop variant for total correctness. **[10]**

Task 5:
Record the outputs of your experiments in an HTML file. For each task, record different preconditions, postconditions, loop invariants, and loop variants, and test your code, including the cases where verification failed. **[4]**

General Instructions:

1. This assignment will be done in the same groups of assignment-1.
2. There will be only one submission per group on the CMS.
3. The name of the file should be **id1_LOGIC_A2.zip**, where id1 refers to the BITS ID of the sender.
4. **You are encouraged to discuss with your friends but refrain from copying the code and submitting.**
5. You have to demo the code to the instructor on a scheduled date and timing after submission. **It is important to attend the demo, as absence from demo will amount to no credit for the assignment. The tentative date for the Demo will be right after the submission.**