Lab Test 2 : 19CSE205: Program Reasoning
10.11.2020

Department of Computer Science and Engineering
Amrita School of Engineering, Coimbatore
Duration : 1 hour
COs: CO1, CO2, CO4

Instructions:
1. All answers require some explanation.
2. All answers should be written by hand; For Frama-C code you can show screenshot of code with output.
3. Create a word document of answers (please follow the question order, right question number). Each answer should include the screenshot of the written part followed by Frama-C screen shot.
4. Accepted formats: .docx or .pdf. Other formats not accepted.
5. Document should include the exam header, and your name and roll number.
6. The submission is due at 3.00pm and viva/evaluation will start immediately.

1. Consider a C program that checks if the given array is sorted in ascending order. Verify the correctness of this program using loop invariants and Frama-C.

```
/*@

   behavior sorted:


   behavior not_sorted:


   disjoint behaviors;
   complete behaviors;

*/
int arraySorted(int a[], int n)
{
   int i=0;
   while (i<n-1){
      if a[i]>a[i+1]
         return 0;
      i=i+1;
   }
   return 1;
}
```

   1. Define the pre-conditions and show them in Frama-C [3]
   2. Define the post-conditions, and give brief explanation for your choice. Use behaviour to define your post condition (skeletal behaviour code included) in Frama-C. [4]
   3. Give the loop invariants and give brief justification for the same. [4]
   4. Show the correctness of your verification conditions using Frama-C [4]

2. Given an array of size n, transform the elements of the array by incrementing each element by c. The C-Code is given below.

```
void arrayinc(int* a, int n, int c) {
```

```
  for (int p = 0; p < n; p++) {
        a[p] = a[p]+c;
  }
}
```

1. Define the pre-conditions and show them in Frama-C [3]
2. Define the post-conditions, and give brief explanation for your choice. Use behaviour to define your post condition (skeletal behaviour code included) in Frama-C. [4]
3. Give the loop invariants to verify total and partial correctness and give brief justification for the same. [4]
4. Show the correctness of your verification conditions using Frama-C [4]