

## Assignment Set-III

### Functional Programming using Common LISP

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- Assignment will be evaluated by TAs.
  - You need to submit complete source codes, executables and the documentation of the answers for the cases mentioned in the assignments
  - Clearly document your assumptions
  - All codes must be properly documented and good code writing practice should be followed (carry marks).
  - Copying is strictly prohibited. Any case of copying will automatically result in F for the whole course, irrespective of your performance in the other parts of the lab.
  - **Submission Deadline: November 20, 2016**
  - Total weightage: 25%
  - Marks distribution: 20,30, 50
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#### Assignment I: [20 marks]

Department of CSE planned to offer free sweat shirts to the randomly selected students. The CSE office requested your help to randomly select the students. To help some of your friends, you need to write your own random function which selects the students whose roll number sum (sum of the digits of the roll number) results in a prime number. Submit your inputs and document the outputs (selected students) for the students registered in the courses: CS 431, CS 341, CS 201 and MA 101.

Note: You can find the student list in the academic section of the intranet webpage:

<http://shiloi.iitg.ernet.in/~acad/intranet/coursewiseview.php>

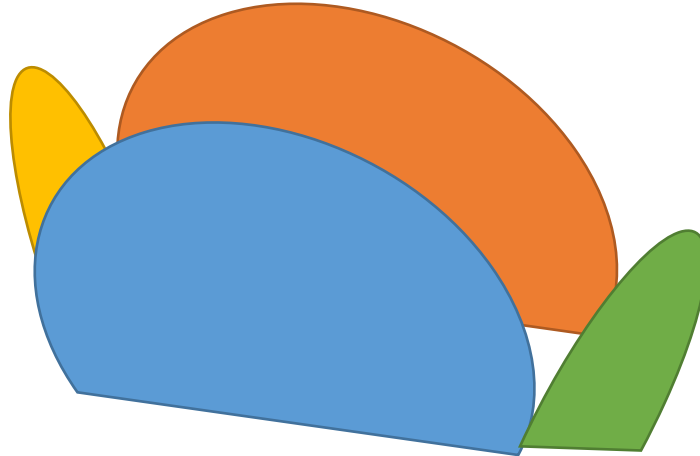
#### Assignment II: [30 marks]

CSE department is about to build a fountain in front of B.Tech 4<sup>th</sup> year lab (in ground floor). Department requested the faculties to suggest their favorite design for the fountain (in terms of an algebraic expression). Fearing the complexity of the design, the department relied on the numerical integration techniques to compute the cost for each of the suggested design (cost is proportional to the area covered by the design).

So, kindly implement the Simpson rule and trapezoidal rule to help the department in choosing the lowest costing design.

Assuming that the suggested designs are:  $4x^2$ ,  $4e^x$ , and  $4x^4-4x^3$ , document the results when the above designs are considered for the interval  $[2, 4]$  (assume number of points as 100). Which design costs the lowest?

Example:



For the fountain that has 4 sides (as shown in figure), each side is described by the  $\sin(x)$  function in the interval  $[0, \pi]$ . So, cost of this design would be proportional to the area covered by  $4\sin(x)$  for the interval  $[0, \pi]$ .

Assignment III: [50 marks]

- In the below figure we show some of the hostels in the IIT Guwahati with the distance between them (indicated in red color, m:meters).
- Assume that the distance between *Brahmaputra* and *Dihing* hostels is 2m (not indicated in the figure)
- Scenario:  
For the 19<sup>th</sup> convocation, Prime Minister (PM), Shri Narendra Modi is visiting the campus. Due to this, some entrance restrictions are imposed for the road paths shown in the figure. Only one way movement is allowed for all the roadways (either left-to-right or right-to-left). The directional restrictions (left-to-right or right-to-left) will be dynamic depending upon the functions attended by the PM. These restrictions will be live streamed on the intranet. Students check these restrictions before starting to meet their friends.  
Now some students want to meet their friends from other hostels.
- Problem:  
Write a program to suggest the best (shortest) route to be followed by them to reach their friends' hostel.

Note: Assume that the restrictions will not change between a student starts from his/her hostel and reaches to their friend's hostel.

➤ Documentation:

Document the results for any 3 restriction scenarios. Also, document the limitations of your program, that is, for which restriction scenarios your program will not work.

