Instructions:

Try to solve all problems on your own. If you have difficulties, ask the instructor or TAs.

Please follow the instructions given below to prepare your solution notebooks:

- Please use different notebooks for solving different Exercise problems.
- The notebook name for Exercise 1 should be `ROLLNUMBER-labLL-ex1.ipynb`. `ROLLNUMBER-labLL-ex2.ipynb`, etc for others. 'LL' is the two digit lab number (lab-3 is 03, etc).
- Please ask your doubts to TAs or instructors or post in Moodle Discussion Forum channel.
- You should upload on the .ipynb files on Moodle (one per exercise).

Only the questions marked **[R]** need to be answered on paper. Write legible and to-the-point explanations. The work-sheet on which you write needs to be submitted before leaving the session.

Some other questions require plotting graphs (histograms, trajectories, level-sets etc) or tables. Please make sure that the plots are present in the submitted ipython notebooks.

Submission Time: Please check the submission deadline as show on the assignment web-page in Moodle. Late submissions will be accepted upto 24 hours from the deadline. All late submissions will have a penalty of 3 marks. Submissions later than 24 hours after the deadline will not be accepted.

The sixth laboratory has exercises on optimization under uncertain scenarios.

Objective of this Lab will be to introduce simulation of stochastic processes. We start with simulation of random variables and then move on to Markov chains.

Exercise [5 Marks] Generate Bernoulli and Binomial random variable sand find expectation using the simulation.

Exercise [5 Marks] Genrate Dice and find expectation using the simulation.

Exercise [5 Marks] Generate exponential random variables using CDF. and find expectation using the simulation.

Exercise [5 Marks] Generate normal random variable and find the expectation using the simulation.

Exercise [5 Marks **R**] Generating one and two dimensional random walks and simulate first return time.

Exercise [5 Marks, **R**] Generating a stochastic matrix and then simulate a markov chain using this transition matrix. Simulate the hitting times.