DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY

Algorithm Laboratory (CSLR41)

Assignment 3a

Problem Statement: Update Quick sort algorithm implemented in Assignment 3 such that every time a random element is chosen as the pivot.

Input: *n* random integers where n = 10, 100, 1000, 10000, 100000, 1000000.

Output: For this implementations do the following:

1. Analyze the behavior of many different cases and identify the best case and worst case.
2. Plot and find the time complexity in terms of asymptotic notion for all the three cases (best, worst and average over many random cases) by varying input size and noting down the time required for sorting.
3. Compare your results with the algorithms of Assignment 3 and give an analysis. You need to write the cases over the same input, when each of the algorithms among the total 4 algorithms (Merge sort, Quick sort, Heap sort) performs better than the other 3 algorithms.
4. Take f(n)=$c_1 n \, long \, n$, g(n) =$c_2 n log \, n$. Plot the graph for the best case, worst case and average of 1000 random cases of the algorithms along with these two functions. Can you find some constants for f(n) and g(n) such that the plot is bounded above by f(n) and below by g(n) for each of the algorithms?
5. Compare performance of your sorting algorithms with the in-build **sort** function.
6. Write your observations and derive possible conclusions.