DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY
Algorithm Laboratory (CSLR41)

Assignment 3

Problem Statement: Implement Merge sort, Heap sort and Quick sort taking first element as the pivot.

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

Output: For each of these implementations do the following:

1. Analyze the behavior for best case, worst case and some random cases.
2. Plot and find the time complexity in terms of asymptotic notion for all these three cases by varying input size and noting down the time required for sorting.
3. For the same random input, find when each algorithm is performing better than the other two.
4. Compare your results with the algorithms of Assignment 2 and give an analysis. You need to write the cases over same input, when each of the algorithms among the total 6 algorithms performs better than the other 5 algorithms.
5. Take f(n)=$c_1 n \, long \, n$, g(n) =$c_2 nlog \, n$. Plot the graph for the best case, worst case and average of 100 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?
6. Compare performance of your sorting algorithms with the in-build **sort** function.
7. Optimize your best algorithm implementation (without changing the algorithm) to make it faster than the in-built sort function for every case over atleast n= 100000 .
8. Write your observations and derive possible conclusions.