ALGORITHMS (M.TECH CS + PHD)
ASSIGNMENT - 1

DUE: By 16th August 2019

Solve the following problems and submit a hand-written document.

1. There are many sorting algorithms proposed in the literature. Find one algorithm that you have not seen earlier(avoid the popular ones): (i) describe the algorithm, (ii) trace it on an example and (iii) write the complexity analysis of the algorithm.

2. Two people, say A and B rank n movies by giving distinct numbers 1 to n. Two people have similar taste if the relative ordering of their rankings is the same. That is, suppose A has given ranks n_1 and n_2 for two movies P and Q respectively, where $n_1 < n_2$. Then if B's ranks for P and Q follow the same relative ordering then we say A's ranking is similar to B. Propose a measure to compute similarity/dissimilarity of their rankings and give an algorithm to compute the same.

3. Analyze the running times of the following algorithms by framing their time complexity as a recurrence relation and solving it. Which do you choose for its speed : A or B?

    - Algorithm A solves problems by dividing them into five subproblems of half the size, recursively solving each subproblem, and then combining the solutions in linear time.
    - Algorithm B solves problems of size n by dividing them into nine subproblems of size $n/3$, recursively solving each subproblem, and then combining the solutions in $O(n^2)$ time.

4. Propose an algorithm that splits an input array S containing integers into three sets about a value v(given) : S_1 having elements less than v, S_2 containing elements equal to v, and S_3 with the elements greater than v. This algorithm should not use any extra memory of $O(n)$.