ESO207 Assignment-1

Submission by: Sept. 21, 2020   **Maximum marks:** 100

Instructions

- The assignment is open book and open notes.

- Use of internet or some discussion with other students on how to solve the problem is acceptable.

- The submission however, should be written by you alone and not copied from anywhere. Any instance of copying literally (as opposed to using the same method to solve the problem), if caught, will be penalized severely.

Q1(marks 30+30+40) Recall from lecture 2, the definition of inversions and number of inversions in an array. It is straightforward to compute the number of inversions in an array in $O(n^2)$ time. Using divide and conquer approach, as used in merge sort, an $O(n \ log \ n)$ time algorithm can be designed for this problem.

(a) Write the pseudo-code for an $O(n \ log \ n)$ time algorithm for computing the number of inversions in an array.

(b) Prove correctness of your algorithm, using loop invariant technique. Your proof may be informal but it should be precise and clear.

(c) Implement your algorithm in a programming language of your choice: C, C++, Java or Python. Your program should reflect the pseudo-code of part (a). Do not use any esoteric features of the language or any non-trivial library functions beyond what is available in the standard language.

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