Birla Institute of Technology and Science-Pilani, Hyderabad Campus
First Semester 2020-2021
Lab Sheet-11
CS G526: Advanced Algorithms and Complexity
Date: 13/01/21

General Instructions: Argue logically. Write it in a manner that explains your logic very clearly. Do not miss steps in between.

Problem-1: [40 pts] Suppose you are given a set S of n elements. Write a program to return all possible subsets of size r. The input to your program is a set S and an integer r. The output of the program is the list of all possible collections of r elements from S. For example, if the input set $S = \{1, 2, 3\}$ and $r = 2$ then your program should output $\{1, 2\}, \{2, 3\}, \{1, 3\}$.

Problem-2: [60 pts] Let $A[1...n]$ be an array of n distinct numbers. We call a pair (i, j) an inversion if $i < j$ and $A[i] > A[j]$. For example, the array $< 3, 5, 1, 2 >$ has 4 inversions, i.e, $(3, 1)$, $(3, 2)$, $(5, 1)$, $(5, 2)$. Given an array A of n distinct elements, design an $\Theta(n \log n)$ algorithm to count the number of inversions in the array.