Problem – 4:

Time taken for the algorithms to run for several inputs are as follows:

For k = 5

Input : 1000000 integers

O(n) Algorithm : 63 ms

Heap based Algorithm : 16 ms

Input : 10000000 integers

O(n) Algorithm : 469 ms

Heap based Algorithm : 78 ms

Input : 25000000 integers

O(n) Algorithm : 484 ms

Heap based Algorithm : 94 ms

Input : 35000000 integers

O(n) Algorithm : 501 ms

Heap based Algorithm : 125 ms

For k = 100000

Input : 1000000 integers

O(n) Algorithm : 109 ms

Heap based Algorithm : 1588 ms

Input : 10000000 integers

O(n) Algorithm : 626 ms

Heap based Algorithm : 2533 ms

Input : 25000000 integers

O(n) Algorithm : 735 ms

Heap based Algorithm : 2584 ms

Input : 35000000 integers

O(n) Algorithm : 766 ms

Heap based Algorithm : 2790 ms

When the K value is small, the heap based algorithm clearly runs faster than the O(n) algorithm. As the K value increases, the O(n) algorithm beats the heap based algorithm.

This may be because the heap size to be maintained is large as K value increases and it takes time to percolate down whenever a new element is added to the priority queue.

But the advantage of using heap based algorithm is the k largest elements will be returned in ascending order.