

Q.1(a) Done in file "counting.cpp"

(b) Done in file "Bucket.cpp"

(c) Done in file "interval.txt"

(d) Done in file "wordsort.cpp"

(e) The worst case for bucket sort is when all the elements are placed in a single bucket, since the performance depends upon the sorting algorithm used for sorting each bucket. which is insertion sort with time complexity $O(n^2)$.

Ex: $ACJ = \{0.123, 0.134, 0.145, 0.156\}$

Q.2 (a) Done in file "Radix.cpp"

(b) The time complexity is $O(kn)$ and space complexity is $O(k+n)$. where n is number of elements and k is the number of bits required to represent largest element in the array. Suppose we are sorting n integers from 0 to $u-1$. The maximum number of digits will be $\log_k u$. To minimize running time we want minimize $O((n+k) \log_k u)$. So $k=u$ for the best time of radix sort which will be $O(n \log_n u)$.