Algorithm 2017 Spring

Homework 2

範圍：Chapter 6~ Chapter 9

1. **(10pts) Illustrate the operation of $RADIX-SORT$ on the following list of English words: COW, DOG, SEA, RUG, ROW, MOB, BOX, TAB, BAR, EAR, TAR, DIG, BIG, TEA, NOW, FOX.**

2. **(10pts) Illustrate the operation of $BUCKET-SORT$ on the array $A = \langle .79, .13, .16, .64, .39, .20, .89, .53, .71, .42 \rangle$.**

3. **(10pts) What is the running time of HEAPSORT on an array A of length n that is already sorted in increasing order? What about decreasing order?**

4. **(10pts) Prove that COUNTING-SORT is stable.**

5. **In a heap:**
   A. **(3pts) What are the minimum numbers of elements if the height is *h*? Show your solution process.**
   B. **(3pts) What are the maximum numbers of elements if the height is *h*? Show your solution process.**
   C. **(4pts) Show that an n-element heap has height $\lfloor \log n \rfloor$.**

6. **(10pts) Show that the running time of QUICKSORT is (n^2), when the array A contains distinct elements and is sorted in decreasing order.**

7. **(10pts) Show that we can find the both of minimum and maximum using at most $3\lfloor n/2 \rfloor$ comparisons**

8. **(10pts) Is the sequence (23, 17, 14, 6, 13, 10, 1, 5, 7, 12) a max-heap?**

9. **(10pts) Answer True of False for each the following statements on sorting algorithms.**
   (1) We can use a random number generator to improve the performance of Quick sort.
   (2) Radix sort can only be performed on sequential lists, not on linked lists.
   (3) The time complexity for comparison-based sorting algorithm is Ω(n log n).
   (4) Radix sort requires the minimum data space.
   (5) The conditions of worst case are the same for bubble sort and quick sort.

10. **(10pts) You are told that a list of 10,000 words is already in order but you wish to check it to make sure and sort any words found out of order. Which of the following sorting algorithms would you choose: insertion sort, bubblesort, mergesort or quicksort? Explain your answer clearly.**