

Assignment 6

1. What is the running time of insertion sort if all elements are equal? **[5 Points]**

2. Show how heap sort processes the input 142, 543, 123, 65, 453, 879, 572, 434, 111, 242, 811, 102. Show the sorting step by step. **[5 Points]**

3. Sort 3, 1, 4, 1, 5, 9, 2, 6 using merge sort. (Show steps) **[5 Points]**

4. Show the result of running Shellsort on the input 9, 8, 7, 6, 5, 4, 3, 2, 1 using the increments {1,3,7}. (Show steps) **[5 Points]**

5. A sorting algorithm is stable if elements with equal keys are left in the same order as they occur in the input. Which of the sorting algorithms in Chapter 7 are stable and which are not? Explain. **[5 Points]**

6. Prove that any comparison-based algorithm to sort 4 elements requires 5 comparisons. Give the algorithm to sort 4 elements in 5 comparisons. **[10 Points]**

7. Show the result of the following sequence of instruction: union(1,2), union(3,4), union(3,5), union (1,6), union(3,7), union(8,9), union(1,8), union(3,10), union(3,11), union(3,12), union(3,13), union(14,15), union(16,0), union(14,16), union(1,3), union(1,14) where the union are
- [15 Points]**

- a. Performed arbitrarily
- b. Performed by height
- c. Performed by size