CS 4413 Algorithm Analysis **Homework 4**

Fall 2019 **Due:** Sep 19, 2019

Please answer each of the following problems.

1. Using Fig 6.3 (Refer Textbook) as a model, illustrate the operation of BUILD-MAX-HEAP on the array A = $\langle 7, 19, 16, 10, 22, 3, 6, 33, 21 \rangle$ (10 pt)

2. Using Fig 6.2 (Refer Textbook) as a model, illustrate the operation of MAX-HEAPIFY (A, 3) on the array A = $\langle 27, 17, 3, 1, 13, 10, 1, 5, 7, 12, 4, 8, 9, 0 \rangle$ (10 pt)

3. Derive the recurrence for the average time complexity of Quick Sort(10 pt)

4. Solve the following recurrences using method of substitution:

   (a) $T(n) = 2T(n/4) + 1$, T(1) = 1 (2.5 pt)

   (b) $T(n) = 2T(n/4) + n^2$, T(1) = 1 (2.5 pt)

   (c) $T(n) = 3T(n/2) + 5n$, T(1) = 1 (2.5 pt)

   (d) $T(n) = 2T(n/2) + (n - 1)$, T(1) = 1 (2.5 pt)