

# CSCI 305, Homework # 5

YOUR NAME HERE

Due date: Midnight, May 14

1. Analysis of  $d$ -ary heaps (problem 6-2 in the text).

A  **$d$ -ary heap** is like a binary heap, but (with one possible exception) non-leaf nodes have  $d$  children instead of 2 children.

- (a) How would you represent a  $d$ -ary heap in an array?
- (b) What is the height of a  $d$ -ary heap of  $n$  elements in terms of  $n$  and  $d$ ?
- (c) Give an efficient implementation of EXTRACT-MAX in a  $d$ -ary max-heap. Analyze its running time in terms of  $d$  and  $n$ .
- (d) Give an efficient implementation of INSERT in a  $d$ -ary max-heap. Analyze its running time in terms of  $d$  and  $n$ .
- (e) Give an efficient implementation of INCREASE-KEY( $A, i, k$ ), which flags an error if  $k < A[i]$ , but otherwise sets  $A[i] = k$  and then updates the  $d$ -ary max-heap structure appropriately. Analyze its running time in terms of  $d$  and  $n$ .