Boğaziçi University
Department of Physics

Phys 499 Spring 2007

Problem Set #3

Due in class Wednesday, 28 Mar 2007

Note: Submit your *C* codes in printed form with an example of input and output data set. Send the codes by email. Do not compress the source codes.

Problem 1: – 40 pts
Implement the *heapsort* algorithm in C as we defined in class. Use the skeleton code for the sort algorithms to produce random array dynamically.

Problem 2: – 60 pts
A **d-ary heap** is like a binary heap, but instead of 2 children, nodes have d 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. Analyze its running time in terms of d and n.

d) Give an efficient implementation of INSERT. Analyze its running time in terms of d and n.

e) Give an efficient implementation of HEAP-INCREASE-KEY(A, i, k) which sets $A[i] \leftarrow max(A[i], k)$ and updates the heap structure appropriately. Analyze its running time in terms of d and n.