THE OPEN UNIVERSITY OF SRI LANKA
B.Sc. DEGREE PROGRAMME: LEVEL 04
OPEN BOOK TEST: 2010
CSU 2279: DATA STRUCTURES AND ALGORITHMS

DURATION: ONE AND HALF HOURS (1 ½ HOURS)

Date: 01st April, 2010 **Time: 4.00 pm – 5.30 pm**

Answer ALL questions.

Q1.

a) What is a "Data Structure"?

b) Describe what you meant by "Abstract Data Type (ADT)".

c) Give three examples for ADTs.

d) What is meant by the term **"abstract"** in the abbreviation "ADT"?

e) Define the term "Encapsulation" with respect to data structures.

f) Briefly describe the term "Operands" related to ADTs.

g) State the advantages and disadvantages of a Linked List.

h) What is the advantage of an "Array" when comparing with an "Ordered Array"?

i) How many comparisons are needed for the following "cases" when we use the straight sequential search algorithm for an array with N no. of items?

   i. Best case.

   ii. Worst case.

   iii. Average case.

j)

3	2	7	10	4	5

Consider the above array and suppose that you want to find the elements in the array by using the straight sequential searching algorithm.

   i. How many comparisons are needed to search the value 7, in the above array?

   ii. How many comparisons are needed to search the value 12, which is not included in the above array?

Q2. An expression given below can be used to find the Big – Oh notation. Use it to answer the questions from (a) to (c).

$$\mathbf{T(n) \leq C f(n) \quad \forall n \geq n_0}$$

a) Define T (n) and f (n).

b) What can be measured by using the Big – Oh notation in any algorithm?

c) Consider an array with N number of items. A particular searching algorithm uses N-1 comparisons on the first pass, N-2 comparisons on the second pass and so on. Therefore, the formula for the sum of no. of comparisons associated with the algorithm is as follows.

$$(N - 1) + (N - 2) + (N - 3) + \cdots + = N * (N - 1) / 2$$

Find f (n).

(*Hint:*$T(N) = N * (N - 1) / 2$)

d) Simplify the following expressions.

i. $O(N^2 + N)$

ii. $O(N * N)$

iii. $O(5 * N)$

Q3.

a) Explain the differences between "Internal sorting methods" and "External sorting methods".

b) What are the main steps followed in external sorting methods?

c) Write down the steps involved in sorting the following array using the merge Sort algorithm (Balance Multiway Merging).

64	21	33	70	12	85	44	3	97	24	51	40