ESC101 : Fundamental of Computing

Lab 10 for 30 October 2008

Maximum Marks = 10

1. (4 marks)
   This exercise is to enhance understanding of execution of recursive methods. Given an array A of integers, and two non-negative integers i, j with $0 \leq i \leq j < A.length$, we define $\mathbf{Min}(A, i, j)$ as the smallest number from $\{A[i], ..., A[j]\}$. We can define $\mathbf{Min}(A, i, j)$ recursively as follows.
   If $i = j$, then $\mathbf{Min}(A, i, j)$ is $A[i]$.
   If $i < j$, then let $mid = (i + j)/2$,

   $$\mathbf{Min}(A, i, j) = \min(\ \mathbf{Min}(A, i, mid),\ \mathbf{Min}(A, mid + 1, j))$$

   Write a recursive method based on the above formulation. For each recursive call invoked print the value of i and j on the monitor. Observe the execution of your programs on arrays of size 1,3,5,7.

2. (6 marks)
   A superset of a set A is the set of all subsets of A. For example superset of $\{1, 2, 3\}$ is $\{\{\}, \{1\}, \{2\}, \{3\}, \{1, 2\}, \{2, 3\}, \{1, 3\}, \{1, 2, 3\}\}$. Design a program which receives a positive integer n from command line and prints the elements of the superset of $\{1, 2, ..., n\}$. For example, for input 2, the output should be :
   $\{\}$
   $\{1\}$
   $\{2\}$
   $\{1, 2\}$

   Hint : Give a recursive formulation for the superset of A. The elements of the superset can be partitioned into two groups by a given element $x \in A$: those subsets which contain x and those which do not contain x.