ESC101 : Fundamental of Computing
Lab 10 for Saturday, 1st November 2008
Maximum marks = 10

1. (marks = 6)
   Write a program which receives a string S and an integer L from command line with the restriction that S has all distinct characters and length of S is at least L. The program must print all strings of length L which uses characters from string S. Note that a character may appear multiple times in a string. For example, for input *abc*, and $L = 2$, the output should be

   ```
   aa
   ab
   ac
   ba
   bb
   bc
   ca
   cb
   cc
   ```

   Hint : Try to give a recursive formulation of the corresponding set of string which you wish to enumerate. Then translate this formulation carefully in JAVA code. You may like to see the code of the program permutation.java available on the course webpage for this purpose.

2. (marks=4)
   This exercise is to enhance your understanding about the 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 to compute $\mathbf{Min}(A, i, j)$. 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.