**Meteorological Data Analysis Lab**

**LAB 2: factorials, combinations and permutations**

 **Purpose:**

This Lab presents the basic concepts and methods for computing the factorial, permutations and combinations using Microsoft EXCEL.

 **Theory:**

The factorial of a counting number is obtained by successively multiplying it by the next smaller counting number until reaching 1.

k! = k(k − 1) · · · 2 · 1.

Note that : 0! = 1 and 1!=1.

A permutation of r objects from a collection of m objects is any ordered arrangement of r of the m objects. The permutation can be given by:

n Pr =$ \frac{n!}{\left(n-r\right)!}$

A combination of r objects from a collection of m objects is any unordered arrangement of r of the m objects in other words, any subset of r objects from the collection of m objects. Note that order matters in permutations but not in combinations. The combinations can be given by

n C r = $ \frac{n!}{r!\left(n-r\right)!}$

**Methodology:**

The Excel Combin function calculates the number of combinations (in any order) of a given number objects from a set.

The syntax of the function is:

COMBIN( number, number\_chosen )

Where number is the number of objects in the set and number\_chosen is the number of objects to be chosen from the set.

The Excel Permut function calculates the number of permutations of a specified number of objects from a set of objects.

The syntax of the function is:

PERMUT( number, number\_chosen )

Where number is the number of objects in the set and number\_chosen is the number of objects to be chosen from the set.

The numbers 0 through 5 are entered into A1 through A6 in EXCEL file and = FACT(A1) is entered into B1 and a click-and-drag is performed from B1 through B6. Then the chart wizard is used to plot the points. The

function = FACT(n) is the same as n!. For n=0, 1, 2, 3, 4, and 5, = FACT(n) equals 1, 1, 2, 6, 24, and 120.

1. Determine 0!, 1!, 2!, 3!, 4!, and 5!.

2. From the following table calculate the combinations and permutations values.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| n | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
| r | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Combinations |  |  |  |  |  |  |  |  |
| Permutations |  |  |  |  |  |  |  |  |

3. Calculate 4C2 , 7C5, 10C3  and 4P2, 7P5, 10P3. using Excel function and factorial function .

***Note (using Microsoft Excel to solve the questions)***