CS19001: Programming and Data Structures Laboratory

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http://cse.iitkgp.ac.in/~aritrah/course/lab/PDS/Autumn2018/CS19101_PDS-Lab_Autumn2018.html

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Programming Assignments

Complete and submit during lab

Assignment 1: [Binomial-Sum]

Recall the binomial theorem:

$$(x+y)^n = {}^nC_0 x^n y^0 + \cdots + {}^nC_i x^{n-i} y^i + \cdots + {}^nC_n x^0 y^n$$

Write a C program which takes as input two reals (floats) x and y, a non-negative integer n and returns the value of $(x+y)^n$ as double. Your program should contain the following functions.

- **long int factorial(int);**
- **double power(float, int);**
- **long int find_ncr(int, int);**
- **double find_binomial_sum(float, float, int);**

You are NOT ALLOWED to use **math.h** library.

Do not use a large value of n (> 10 say) for testing purposes. Otherwise, the factorial computation may overflow.

Assignment 2: [Derive-Poly]

Main C-Program

- From `main()`, request user to provide the size of array (say n) and all the n array elements (real-valued), $a_0, a_1, a_2, \ldots, a_{n-1}$. This will symbolically represent a polynomial as follows, $f(x) = a_0 + a_1x + a_2x^2 + \cdots + a_ix^i + \cdots + a_{n-1}x^{n-1}$.
- Then ask user to input the order of the derivative (i.e. k^{th}). Please note that, $n \geq k$.
- Print the array elements and the original polynomial, $f(x)$.
- Call `derive()` with suitable parameters (mentioned below).
- Print new polynomial $f^k(x)$ after performing k^{th} derivative over $f(x)$.

Recursive Function:

```
void derive(double a[ ], int n, int k);
```

- Write a **recursive function** `derive()` which takes as argument an array of real numbers, the array size n, and the order of the derivative k.
- When the function returns, the array should contain elements representing the k-th derivative, $f^k(x)$, of the original polynomial, $f(x)$. The new polynomial will be symbolically represented as follows, $f^k(x) = a'_0 + a'_1x + a'_2x^2 + \cdots + a'_ix^i + \cdots + a'_{n-1-k}x^{n-1-k}$.

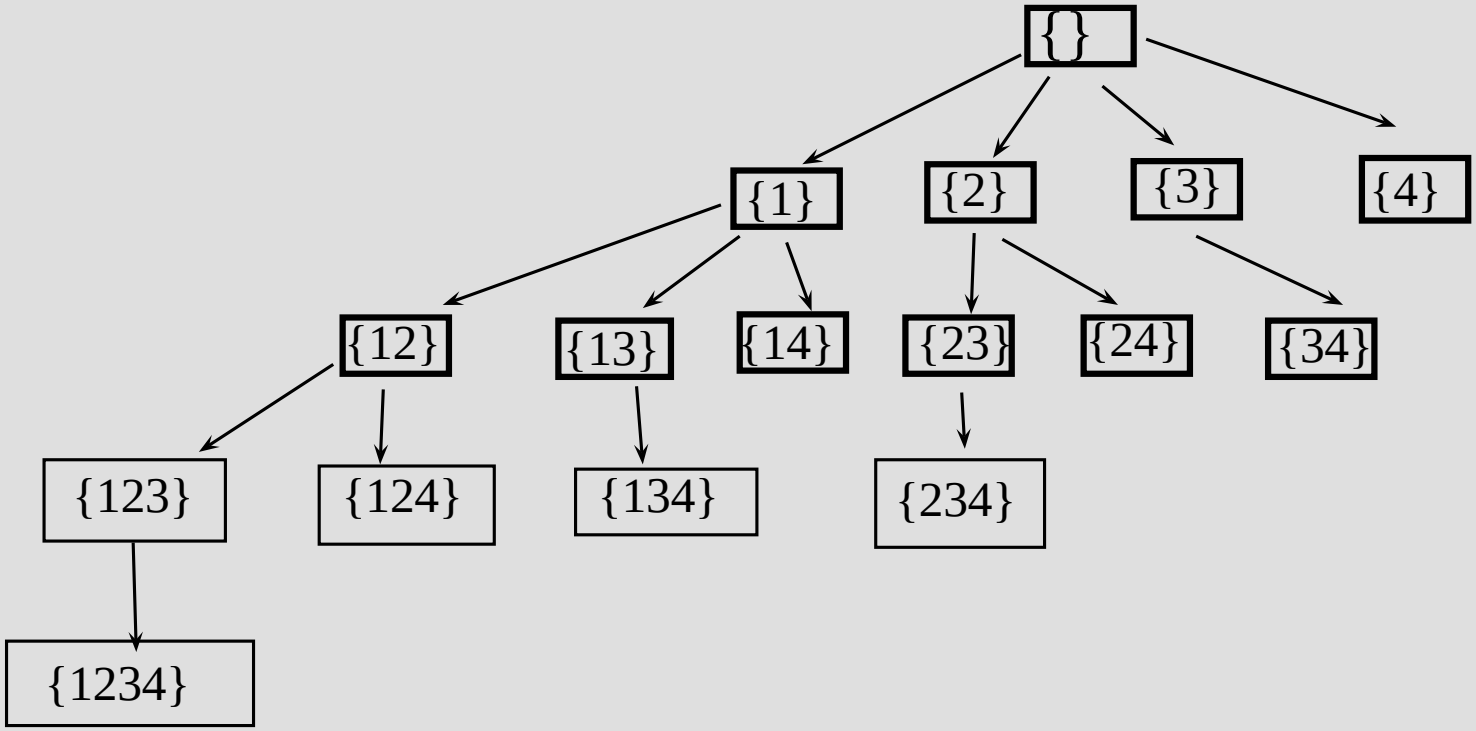
Assignment 3: [Power-Set]

Write a recursive function which takes as argument an integer n and prints all possible subsets of the set $\{1, 2, 3, \cdots, n\}$.

- For both the assignments, write suitable main() functions which shall call the respective functions.
- To help you in designing the recursion, the recursion tree is provided next.

Assignment 3: [Power-Set]

recursion tree, n=4



Thank You