National University of Computer and Emerging Sciences

Laboratory Manual # 04
Object Oriented Programming

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Section	BCS-2E
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Instructions for lab submission:

You have to submit source code (.cpp) files along with a word document. In the word document you have to give the heading of each exercise/question, then paste your source code and output snippet. Save your word document in the following format: roll numberlab no-section i.e. 22l-0008-lab4-BCS2B.

Objectives:

In this lab students will practice:

- Pointers
- Double Pointers
- Passing double pointers to functions
- Shallow Copy and Deep copy

1. Exercise: Marks: 05

Write a function int stringLength(char* str) that takes a char* parameter representing a string and returns the length of the string (excluding the null terminator).

2. Exercise: Marks: 15

Implement a function char** tokenizeString(char* str, char* delimiter) that tokenizes a given string str based on the provided delimiter string and returns an array of strings (char**) representing the tokens and print the tokens and also their reverse form.

First find the number of tokens that can be form from str, this will be number of rows for char ** tokenizeString(...). Each row will have different number of columns e.g if string is **hello,pointers** and delimiter is '**,**' then your result will be :
Tokens:

h	e	l	l	o	/0			
p	o	i	n	t	e	r	s	/0

Reversed form of Tokens:

p	o	i	n	t	e	r	s	/0
h	e	l	l	o	/0			

Return the char ** array to main function and print your result.

Don't allocate extra memory and release memory before exiting the program.

3. Exercise: Shallow copy and deep copy Marks: 15

Write a function int** create2DArray(int rows, int cols) that dynamically allocates memory for a 2D integer array with the given number of rows and columns. This function should return a pointer to the array. A. Shallow Copy:

a. Implement a function int** shallowCopy2DArray(int** arr, int rows, int cols) that performs a shallow copy of the 2D array. This involves copying the pointers to the rows of the array but not the actual data. Return a pointer to the newly created 2D array.

B. Deep Copy:

a. Develop a function int** deepCopy2DArray(int** arr, int rows, int cols) that performs a deep copy of the 2D array. This involves allocating new memory for the array and its contents, and copying the elements from the original array to the new memory block. Return a pointer to the newly created 2D array.

In main function test the shallow copy and deep copy functionality, modifying the array returned by shallowCopy2DArray() function will affect the original 2D array but changes made in the array returned by deepCopy2DArray() will not affect the original array.