North South University

Department of Electrical and Computer Engineering

CSE 225L.13 (Data Structures and Algorithms Lab)

Lab 2: Introduction to C++ (Part 2) – Dynamic Memory Allocation

Instructor: Syed Shahir Ahmed Rakin, Arfana Rahman

Objective:

- Learn how to allocate memory dynamically and de-allocate memory originally assigned dynamically.
- Remind yourself once again how pointers work.
- Master the syntax of operators ***new*** and ***delete***

Revisiting Pointers:

Remember the pointers? They are different type of variables that stores the memory address as its value. A pointer variable points to a data type (like int or string) of the same type and is created with the * operator.

For example, we have a variable called **num** and a pointer called **ptr** which points to the address of the **num** variable

```
int num = 20;
int* ptr = &num;
cout << num << "\n"; // Output = 20 (value of num)
cout << &num << "\n"; // Output = 0x61fe14 (address of num)
cout << ptr << "\n"; // Output = 0x61fe14 (address of num)
```

New and Delete keywords:

The ***new*** keyword is used for dynamically allocated space and the ***delete*** keyword is used for freeing up the allocated space.

Examples using ***new*** keyword	Examples using ***delete*** keyword
`int *a = new int;`	`delete a;`
`char *b = new char[5];`	`delete [] b;`
`float *c = new float[3*someVar+1];`	`delete [] c;`
`double **d = new double*[10];`	`delete [] d;`

Test Program:

Using the ***new*** operator, allocate an integer. Assign a value to that integer by user input and then print the value. De-allocate that integer by using the ***delete*** operator

```
int *ptr;
ptr = new int;
cin >> *ptr;
cout << *ptr << endl;
delete ptr;
ptr = NULL;
```

Tasks:

1. Using the ***new*** operator, allocate an integer array of user-specified size (the user gives the size of the array as input). Assign values to the array elements by taking user inputs and then printing the values. Finally, de-allocate the array using the ***delete*** operator.
2. Using the ***new*** operator, allocate a two-dimensional character array. Again the number of rows and columns is going to be provided by the user as input. All of the rows are the same size. Take character strings as input from the user and then print the strings. Finally, de-allocate the array using the ***delete*** operator.