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| **Data Structures & Algorithms**  Diploma in IT, CSF  Year 2 (2024/25) Semester 3 | **Week 4** |
| **1 Hour** |
| **Tutorial 4 – Stacks** | |

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| **IMPORTANT**   * Upload all your answers to Brightspace by the designated time stated in Brightspace. |

1. Suppose that s and t are empty stacks and a, b, c, and d are objects. What do the stacks contain after the following sequence of operations executes?
2. s.push(a);
3. s.push(b);
4. s.push(c);
5. t.push(d);
6. t.push(s.getTop());
7. s.pop();
8. t.push(s.getTop());
9. s.push(t.getTop());
10. t.pop();
11. t.pop();

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1. The specification of the Stack ADT implemented using Pointers is given below.

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| //Stack.h (Pointer-based implementation)  #pragma once  #include <iostream>  using namespace std;  typedef int ItemType;  class Stack  {  private:  struct Node  {  ItemType item;  Node \*next;  };  Node \*topNode;  public:  //Default constructor  Stack();  //Destructor  ~Stack();  //check if the stack is empty  bool isEmpty();  //push item on top of the stack  bool push(ItemType &item);  //pop item from top of stack  bool pop();  //retrieve and pop item from top of stack  bool pop(ItemType &item);  //retrieve item from top of stack  void getTop(ItemType &item);  //display items in stack in order  void displayInOrder();  //display items in stack in order of insertion  void displayInOrderOfInsertion();  }; |

Implement the following operations of the Stack ADT

1. **~Stack();**

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1. **bool pop(ItemType& item);**

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1. **void displayInOrder();** // without worry about changing the stack

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*Note : The stack is empty after the above is executed.*

1. **void displayInOrderOfInsertion();**

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1. Using a stack, implement the **reverse()** function that takes a string as an argument and returns the string with its characters reversed.

For example: **reverse("abcde")** returns **"edcba"**.

The function prototype is:

**string reverse(string);**