Philadelphia University **Student Name:**

Faculty of Engineering **Student Number:**

Dept. of Computer Engineering

Second exam, First Semester: 2010/2011

Course Title:	**Algorithms and Data Structures**	**Date:**	26/12/2010
Course No:	630231	**Time Allowed:**	60 minutes
Lecturer:	Dr. Qadri Hamarsheh	**No. Of Pages:**	2

Information for candidates

1. *This exam paper contains 5 question totaling 15 marks*
2. *The marks for parts of question are shown in round brackets.*

Advices to candidates

1. *You should attempt all sub questions.*
2. *You should write your answers clearly.*

Basic notions: *The aims of the questions in this part are to evaluate the required minimal student knowledge and skills. Answers in the pass category represent the minimum understanding of basic concepts: Building new data structures like linked list, Stack and Queue, using these data structures with different applications*

Question 1 ***(3 marks)***

Multiple Choices: Identify the choice that best completes the statement or answers the question.

1. In a doubly linked list, every node contains the address of the next node except for the ____ node.
   a) middle
   b) first
   c) last
   d) second to last
2. A queue is a ____ data structure.
   a) Last In First Out
   b) Last In Last Out
   c) First In Last Out
   d) First In First Out
3. The queue operation ____ returns the first element of the queue
   a) front
   b) tail
   c) delete
   d) insert

Question 2 ***(3 marks)***

a) Write a pseudocode algorithm for evaluating the RPN expression using stack. ***(2 marks)***

b) What is the value of this postfix expression: **5 1 – 3 * 3 1 – 2 * /** ***(1 mark)***

Familiar and Unfamiliar Problems Solving: *The aim of the questions in this part is to evaluate that the student has some basic knowledge of the key aspects of the lecture material and can attempt to solve familiar and unfamiliar problems of Building new data structures like linked list, Stack and Queue, using these data structures with different applications and using STL Library.*

Question 3 ***(1.5 marks)***

Write the C++ expressions that define an STL stack that will hold string values. Also, add the string "hello" into the stack. Also, write the C++ expression that gives the number of elements stored in your stack.

Question 4 ***(3.5 marks)***

Implement a ***non-member*** function:

`void print_stack_inorder(Stack my_stack)`

that takes a **`Stack`** as input, and prints out all the values in **`my_stack`** in ascending numerical order, e.g. from smallest ***value*** to largest ***value***. To answer this question the only data structure you may use is a **Stack** (or temporary stacks). You may not use lists, arrays, vectors, queues.

Question 5 ***(4 marks)***

Write a member function (using template) for the **`orderedLinkedList`** class; with the following prototype**:**

```
void mergeLists(orderedLinkedList<Type> &list1, orderedLinkedList<Type> &list2);
```

This function creates a new list by merging the elements of list1 and list2.

```
//Precondition: Both lists list1 and list2 are ordered.
 //Postcondition: first points to the merged list, and list1 and list2 are empty.
```

Example: Consider the following statements:

```
orderedLinkedList<int> newlist.
orderedLinkedList<int> list1.
orderedLinkedList<int> list2.
```

Suppose **`list1`** points to the list with elements **2 6 7** and **`list2`** points to the list with elements **3 5 8**. The statement:

```
newlist.mergeLists(list1, list2)
```

creates a new linked list with elements in the order **2 3 5 6 7 8**, also after the preceding statement executes, **`list1`** and **`list2`** are empty.

GOOD LUCK