Data Structures and Algorithms

Lab Journal - Lab 12

Name: ___________________________________

Enrollment #: ___________________________________

Class/Section: ___________________________________

Objective

This lab session is aimed at introducing the students to sorting and the basic sorting algorithms.

Task 1 :

Give answers to the following.

1.	Given the following list of cities, apply and demonstrate the steps of selection sort to arrange the list in lexicographic order. Rome, Oslo, Bern, Stockholm, Barcelona, Munich, Paris

2.	Show the steps of applying simple insertion sort on the given list of numbers. 12 8 4 6 2 0
3.	Consider the application of Bubble sort to a large list of integers. In some cases, the list may already be partially sorted and does not require the algorithm to continue comparisons once the list is sorted. Suggest a way to terminate the algorithm once the list is sorted.
4.	Bubble sort is an example of: • Selection Sort • Exchange Sort • Insertion Sort
5.	How can you sort a given list of integers using a BST?

Task 2 :

Implement the following exercises.

Exercise 1

Implement the following sorting algorithms using a separate function for each. Each function should accept an array of integers and the size of the array and sort the array using the respective algorithm. Also provide a function display() to print the array elements.

- Selection Sort
- Bubble Sort
- Insertion Sort

Exercise 2

For each of the algorithms implemented in Exercise 1, generate a random array of size 'N' (for given values of 'N'), and count the number exchanges and number of comparisons in each of the three algorithms. Present your findings in the given tables.

	Number of Exchanges		
Size of List 'N'	Selection Sort	Bubble Sort	Insert Sort
10			
100			
1000			
5,000			
10,000			
25,000			

	Number of Comparison		
Size of List ‘N’	Selection Sort	Bubble Sort	Insert Sort
10			
100			
1000			
5,000			
10,000			
25,000			

Also generate a line graph (in MS excel) for ‘N’ versus number of comparisons for each of the three algorithms. Likewise, generate a similar graph for ‘N’ versus number of exchanges. Find patterns in the graphs, if any.

Exercise 3

Consider the following algorithm to sort a linked list using Bubble Sort.

```
BUBBLE SORT
INPUT: Pointer ‘START’ to head node of linked list

BOOL Swapped = FALSE
LastPTR= NULL;

DO {
      Swapped = FALSE
      PTR = START
      WHILE (PTR->next != LastPTR)
        {
            IF (PTR->data > PTR->next->data)
            {
                swap(PTR, PTR->next);
                Swapped = TRUE;
            }
            PTR = PTR->next;
        }
        LastPTR = PTR;
    }
    WHILE (Swapped);
```

Convert the given algorithm into a working C++ program to sort a linked list of integers.

Implement the given exercises and get them checked by your instructor. If you are unable to complete the tasks in the lab session, deposit this journal alongwith your programs (printed or handwritten) before the start of the next lab session.

S No.	**Exercise**	**Checked By:**
1.	Exercise 1	
2.	Exercise 2	
3.	Exercise 3	

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