**Lab 4 Solutions**

**Problem1: Solution**

If two objects with equal keys appear in the same order in sorted output as they appear in the input, an unsorted array of elements then the algorithm used for sorting is a stable sort algorithm.

Bubble and Insertion sorts are generally stable sorting algorithms but if while comparing, we use a[j] >= a[j+1] condition for swap, Bubble sort becomes unstable. We should avoid comparing same objects.

SelectionSort is not stable(unstable).

**Problem2: Solution**

We have used upper bound for the divide.

A picture containing text

Description automatically generated

**Problem3: Solution**

Code is in file MergeSortPlus.java

**Problem4: Solution**

a)

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b) Every binary tree of height 3 has at most 23 = 8 leaves – true

Here, every binary tree has height 3, and first tree has 7 nodes, second has 6 nodes and third has 5 nodes. Which shows that every tree has nodes no greater than 8(23).

c) Every binary tree of height n has at most 2n leaf nodes.