**CSE222 / BİL505**  
**Data Structures and Algorithms**  
**Homework #6 – Report**

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1. **Selection Sort**

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| **Time Analysis** | O(N^2) = O(N\*N) because Outer loop traverse elements one by one and inner loop does comparison from i+1 to arr.length |
| **Space Analysis** | Outer loop need space for i,(arr.length-1) and i++ also inner loop needs j, arr.length,j++. In line 15 , need another space for indexOfMinValue. Also in swap function need some spaces. |

1. **Bubble Sort**

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| **Time Analysis** | There is two loop and it is nested. First one is O(N),Second one is O(N). So,O(N\*N) =O(N^2) |
| **Space Analysis** | In Line 12 ,we need space for swapFlag, For loops we need space for i,j,(arr.lenght-1), (arr.lenght,i-1) ,i++ and j++. Also we need space for comparison\_counter and swap. |

1. **Quick Sort**

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| **Time Analysis** | Array List: 1,2,3,4,5,6,7,8 -> Best-Case time complexity becausepartiton split the array into equal halves and when do recursive it also divides equal halves and so on.Also halves are sorted.  Array list: 8,7,6,5,4,3,2,1 -> Worst-Case becuse there is no any sorted one.  Array list:4,2,6,5,1,8,7,3-> It’s not best-case or worst-case.It’s random.It’s close to best-case. |
| **Space Analysis** | In partition function we need space for pivotLast element in line17, j varaible in line 23. Need spaces for comparison\_counte and swap.  In private sort function(line 51),we need indexOfPartition in line 59.  In sort function(line 69), we send two parameters.  Also in sort function(line51) ,we sent two parameters via using partiton function and sort function. |

1. **Merge Sort**

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| **Time Analysis** | Time complexity is consistent because divides the array into two parts recursively.Until sub array have just one element.  O(n logn) |
| **Space Analysis** | There is need a lot of space.Like, sizeSubArrayRight(line 15), sizeSubArrayLeft(line18),temp array for sub array(line21 ansd 23).  Need i,j,k,l for loops. Also cımparison\_count |

**General Comparison of the Algorithms**

Selection Sort is fixed time complexity for all situation and it is O(N^2).

Bubble Sort time complexity is O(N^2).

Merge Sort -> O(n logn) for all situation

Quick Sort -> According to the array sort situation it’s changeable , I mentioned in the table of the Quick sort.

For space merge sort is needed more space than other.Quick sort related to recursive call ,The space for the worst case of Quick Sort is used same space as Merge Sort. Selection and Bubble sort spaces are smaller than Merge Sort and Quick Sort.