Software Development Workshop – IIT KGP

Assignment – 3

1. Given a sorted array of integers, find the number of occurrences of a given target value.
   Your algorithm's runtime complexity must be in the order of O(log n).
   If the target is not found in the array, return 0
   Example:
   Given [5, 7, 7, 8, 8, 10] and target value 8,
   return 2.

2. Implement optimized bubble sort.

3. Implement insertion sort using binary search. (time complexity n*log n instead of n^2)

4. Prove in your own words that the time complexity is n* log n for the algorithm used in the above question (i.e. Q No. 3)

5. In a competition, four different functions are observed. All the functions use a single for loop and within the for loop, same set of statements are executed.Consider the following for loops:

   ```
   A) for(i = 0; i < n; i++)

   B) for(i = 0; i < n; i += 2)

   C) for(i = 1; i < n; i *= 2)

   D) for(i = n; i > -1; i /= 2)
   ```

   If n is the size of input (positive), which function is the most efficient? In other words, which loop completes the fastest? Explain your answer. Explanation is mandatory.

6. Explain worst case and best case with the help of an example code / algorithm. (Any other example than linear search / binary search).

Instructions for submission

- Create a word file of your solution with your Name_AssignmentNumber as the name of the file and mail it to apurvupadeo328@gmail.com on or before 11:59 pm next Sunday i.e. 17th May 2020.
- Any queries can be mailed on the above Email address or posted on the Whatsapp Number – 9657398434
- Any kind of plagiarism shall not be entertained and may lead to your disqualification from the course.