1. If t1(n) ∈ O(g1(n)) and t2(n) ∈ O(g2(n)), then t1(n) + t2(n) ∈ O(max{g1(n), g2(n)}). Prove the assertions.
2. Find the Time Complexity of the below recurrence equation:
3. T(n)=$\begin{cases} 2T\left(\frac{n}{2}\right)+1 & if\ n>1 \\ 1 & otherwise \end{cases}$
4. T(n)= $\begin{cases} 2T(n-1) & \text{if } n>0 \\ 1 & \text{otherwise} \end{cases}$
5. **Big O Notation:** Show that f(n)=n2+3n+5 is O(n2)
6. **Big Omega Notation:** Prove that g(n)= n3+2n2+4n is Ω(n3)
7. **Big Theta Notation:** Determine whether h (n) =4n2+3n is Θ (n2) or not.
8. let f(n)=n^3-2n2+n and g(n) –n2 show whether f(n)= Ω(g(n)) is true or false and justify your answer
9. Determine whether h(n) =nlogn+n is in Θ(nlogn) prove a rigorous proof for your conclusion
10. Solve the following recurrence relations and find the order of growth for solutions.
    Tn) = 4T(n/2) + n^2, T(1) = 1
11. Given an array of [4, -2, 5, 3, 10, -5, 2, 8, -3, 6, 7, -4, 1, 9, -1, 0, -6, -8, 11, -9] integers, find the maximum and Minimum product that can be obtained by multiplying two integers from the array.
12. Demonstrate Binary Search method to search Key = 23, form the array arr[] = {2, 5, 8, 12, 16, 23, 38, 56, 72, 91},
13. Apply merge sort and order the list of 8 elements. Data d=(45,67,-12,5, 22,30,50,20). Set up a recurrence relation for the number of key comparisons made by mergesort
14. Find the no of times to perform swapping for Selection sort. Also estimate the time complexity for the order of notation Set S (12, 7, 5, -2, 18, 6, 13, 4)
15. Find the index of the target value 10 using binary search from the following list of elements [2,4,6,8,10,12,14,16,18,20]
16. Sort the following elements using Merge sort divide-and-conquer strategy [38,27,43,3,9,82,10,15,88,52,60,5] and analyze complexity of the algorithm.
17. Sort the array 64,34,25,12,22,11,90 using Bubble Sort. What is the time complexity of Selection Sort in the best, worst, and average cases?
18. Sort the array 64, 25, 12, 22, 11 using Selection Sort. What is the time complexity of Selection Sort in the best, worst, and average cases?
19. Sort the following elements using insertion sort using Brute Force Approach strategy [38,27,43,3,9,82,10,15,88,52,60,5] and analyze complexity of the algorithm.
20. Given an array of [4, -2, 5, 3, 10, -5, 2, 8, -3, 6, 7, -4, 1, 9, -1, 0, -6, -8, 11, -9] integers, Sort the following elements using insertion sort using Brute Force Approach strategy analyze complexity of the algorithm.