Q. 2

Ans:- In computer Science, binary search, also known as half-interval Search. Logarithmic Search, or binary chop, is a search algorithm that finds the position of a target value within a sorted array. Binary Search compares the target value of middle element of the array.

- Binary Search runs in logarithmic time in the worst case, making O(log n) comparisons, where n is the number of elements in the array the O is Big O notation and Log is the Logarithm.
- Binary Search is faster than Linear Search except for small arrays However, the array must be sorted first to be able to apply binary search.
- binary Search can be used to solve a wider range of problems, such as finding the next smallest or next Largest element in the array relative to the target. even if it is absent from the array.
- The binary search tree and B-tree data structures are based on binary search.

Examples of Binary are following:-

① Algorithm:- Binary Search begins by comparing an element in the middle of array with the target value. if the target value matches the element, its position in the array is returned. if the target value is less than the element, the search continues in the lower half of the array. By doing this, the algorithm eliminates the half in which the target value cannot lie in each iteration.

Given, an array A of n element with values or records $A_0, A_1, A_2, \ldots, A_{n-1}$ sorted such that $A_0 \leq A_1 \leq A_2 \leq \ldots \leq A_{n-1}$.

a) Set L to 0 and R to n-1.

b) if L>R, the search terminates as unsuccessful.

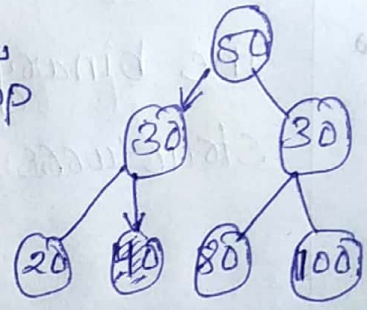
c) Set m to the floor of $\frac{L+R}{2}$, which is the greatest integer less than or equal to $\frac{L+R}{2}$

d) if $A_m < T$, set L to m+1.

e) Now. $A_m = T$, the search is done, return m.

② Performance:- the performance of binary search can be analyzed by viewing the run of the procedure on a binary tree. the root node. of the tree is the middle. element of array.

b) In the worst case binary search makes, $\lfloor \log_2(n)+1 \rfloor$ iterations of the comparison loop where the notation denotes the floor functions that yields the greatest integer less than or equal to the argument and log z is the binary logarithm.



[A tree representing binary Search]