DESIGN AND ANALYSIS OF ALGORITHMS

ICS2301

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Assignment.

Find the time complexity of Quick Sort assuming the array is already sorted.

Given array:
[5, 10, 15, 20, 25, 30]

Solution

- If the first element is chosen as pivot
- The array is already sorted
- One portion has n-1, the other has 0

Therefore:

$$T(n) = T(n-1) + c(n)$$
$$= [T(n-2) + c(n-1)] + c(n)$$
$$= T(n-2) + c(n-1) + c(n)$$
$$=[T(n-3)+c(n-2)]+c(n-1)+c(n)$$
$$= T(1) + C(2+3+4+.....+n)$$

Summation of i = $n(n+1)/2 \Rightarrow (n^2 + n) * {}^1/_2$

Ignore the constants and picking the highest power of n which is n

- $O(n^2)$ will be the time complexity. Ans => **T(n)=O(n2)**

Space Complexity:

- Recursive calls up to depth **n**
  - **O(n)**

Design Strategy

- Divide and Conquer with Balanced Partitioning