Analysis

1. Discuss the time complexity of your recursive algorithm.

Ans.

The overall time complexity of the recursive algorithm is O(n)

Where n is the number of periods. This linear time complexity indicates that the algorithm's execution time increases linearly with the number of periods.

The base case is reached when periods == 0. The function simply returns the presentValue in constant time, O(1). Each recursive call reduces the periods by 1 and calls itself with the updated presentValue. Therefore, for n periods, there is n recursive calls.

1. Explain how to optimize the recursive solution to avoid excessive computation.

Ans. To optimize a recursive solution and avoid excessive computation, one can use memoization. Memoization stores the results of function calls in a cache. When the same inputs are encountered again, the cached results are used instead of recalculating them. This process reduces redundant calculations and improves performance by transforming the time complexity from potentially exponential to linear. Essentially, memoization ensures that each unique computation is performed only once, making the algorithm more efficient.