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LAB-5

Aim : Solving problems using dynamic programming.

1.Fibonacci number : The Fibonacci numbers, commonly denoted  $F_n$ , form a sequence, called the Fibonacci sequence, such that each number is the sum of the two preceding ones, starting from 0 and

2.Dynamic programming : Dynamic programming approach is similar to divide and conquer in breaking down the problem into smaller and yet smaller possible sub-problems. But unlike, divide and conquer, these sub-problems are not solved independently. Rather, results of these smaller sub-problems are remembered and used for similar or overlapping sub-problems.

1. The user is prompted to enter  $n$ .
2. Fibonacci is called to compute the  $n$ th Fibonacci number.
3. The result is then displayed.

3.Brute force approach : The brute force method is by solving a particular problem by checking all the possible cases which is slow. The brute force method is to make a for loop and iterate through the elements of the array. Time Complexity:  $T(n) = T(n-1) + T(n-2)$  which is exponential. We can observe that this implementation does a lot of repeated work (see the following recursion tree). So this is a bad implementation for nth Fibonacci number.

4.Bottom – up approach : A bottom-up approach is the piecing together of systems to give rise to more complex systems, thus making the original systems sub-systems of the emergent system. Bottom-up processing is a type of information processing based on incoming data from the environment to form a perception. We can directly calculate the value of  $F(n)$  if we already know the value of  $F(n-1)$  and  $F(n-2)$ . So if we calculate the smaller values of Fibonacci first, then we can easily build larger values from them. This approach is known as bottom-up approach.