TY. B. Tech.

Design & Analysis of Algorithm

Assignment No: 5

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Longest Increasing Subsequence

Approach 1: Using Vector

Code:

```
#include<iostream>
#include<vector>
usingnamespacestd;

intmain()
{
    intn;
    vector<int>arr;
    cout<<"Enter the size of array"<<endl;
    cin>>n;
    cout<<"Enter the elements of array"<<endl;

    for (inti = 0; i<n; i++)
    {
        intelm;
        cin>>elm;
        arr.push_back(elm);
    }

    vector<int>dp(n, -1);
    dp[0] = 1;
    for (inti = 1; i<n; i++)
    {
        intval = 0;
        for (intj = 0; j<i; j++)
        {
            if (arr[i]>arr[j])
            {
                val = max(val, dp[j]);
```

```
            }
        }
        dp[i] = val + 1;
    }

    cout<<dp[n - 1]<<endl;
    return0;
}
```

Output :

```
Enter the size of array
5
Enter the elements of array
1 2 5 3 4
4
```

Approach 2: Using Dynamic Programming

Code:

```
#include<iostream>
#include<vector>
usingnamespacestd;

intlongestIncreasingSubsequence(vector<int>&nums, intn)
{
    // int n = nums.size();
    vector<int>dp(n, 1); // Initialize dp array with 1's
    intmax_len = 1;      // Initialize the maximum length to
1

    for (inti = 1; i<n; i++)
    {
        for (intj = 0; j<i; j++)
        {
            if (nums[i]>nums[j])
            {
                dp[i] = max(dp[i], dp[j] + 1); // Update
dp[i] if a longer sequence is found
```

```
            }
        }
        max_len = max(max_len, dp[i]); // Update the maximum
length
    }

    returnmax_len;
}

intmain()
{
    intn;
    vector<int>arr;
    cout<<"Enter the size of array : "<<endl;
    cin>>n;
    cout<<"Enter the elements of array : "<<endl;

    for (inti = 0; i<n; i++)
    {
        intele;
        cin>>ele;
        arr.push_back(ele);
    }

    // vector<int>nums = {10, 9, 2, 5, 3, 7, 101, 18};
    intans = longestIncreasingSubsequence(arr, n);
    cout<<"The length of the longest increasing
subsequence(LIS) is : "<<ans<<endl; // Output: 4
    return0;
}
```

Output :

```
Enter the size of array :
5
Enter the elements of array :
1 2 5 3 4
The length of the longest increasing subsequence(LIS) is : 4
```

(This page marks the end of the assignment)