

Dt: 14-08-2020

Assignment: DSA Theory class

1. For each of the following algorithms, indicate (i) a natural size of inputs, (ii) its basic operation, and (iii) whether the basic operation count can be different for inputs of the same size:

same size:

a. Computing the sum of n numbers:

(i) n

(ii) Addition

(iii) No, basic operation count will be the same for inputs of same size

b. Computing $n!$

(i) 1

(ii) Multiplication

(iii) Yes, basic operation count will be different for different inputs of same size

c. finding the largest element in a list of n numbers

(i) n

(ii) Comparison

(iii) Yes, basic operation count will be different for different inputs of same size

d.

ALGORITHM *UniqueElements*($A[0..n - 1]$)

//Determines whether all the elements in a given array are distinct

//Input: An array $A[0..n - 1]$

//Output: Returns “true” if all the elements in A are distinct

// and “false” otherwise

for $i \leftarrow 0$ **to** $n - 2$ **do**

for $j \leftarrow i + 1$ **to** $n - 1$ **do**

if $A[i] = A[j]$ **return false**

return true

(i) n

(ii) Comparison

(iii) Yes, basic operation count will be different for different inputs of same size

e.

ALGORITHM *MaxElement*($A[0..n - 1]$)

//Determines the value of the largest element in a given array

//Input: An array $A[0..n - 1]$ of real numbers

//Output: The value of the largest element in A

$maxval \leftarrow A[0]$

for $i \leftarrow 1$ **to** $n - 1$ **do**

if $A[i] > maxval$

$maxval \leftarrow A[i]$

return $maxval$

(i) n

(ii)Additions, division , comparison

(iii)No ,basic operation count will be the same for inputs of same size

f.

ALGORITHM *Secret*($A[0..n - 1]$)

//Input: An array $A[0..n - 1]$ of n real numbers

$minval \leftarrow A[0]; maxval \leftarrow A[0]$

for $i \leftarrow 1$ **to** $n - 1$ **do**

if $A[i] < minval$

$minval \leftarrow A[i]$

if $A[i] > maxval$

$maxval \leftarrow A[i]$

return $maxval - minval$

(i) n

(ii)Comparison

(iii)No ,basic operation count will be the same for inputs of same size