Name : Masood said

ID : 13723

Dep : Bs(SE)

Paper : Data Structures Mid term

INSTRUCTOR : Muhammad Adil Asst. Prof

Date : 20/AUG/2020

Q#1:

a. What are the requirements of inserting an element in a One Dimensional Array?

ANS : REQUIRMENTS

1) There must be one location empty available in the array .

2) if the new element is to be inserted at the end of the array then there is no problem .

3) if the new element is to be inserted at the start or in the middle of the array , then all the elements from that position will have to move one location forward .

Dry steps :

1. J←n

2. while (j>=k)

a) A[j+1]←A[j]

b) j←j-1

3. A[k]←item

4. n←n+1

5. exit.

b. Find the address of 52nd element of a One Dimensional Array of A[], first element is stored on 54360 and each element occupies 2 memory locations.

SOL : Required

M.A(A[52]) =?

Given

Base(A) = 54360 (lb and w=1)

W=2

K=52

Lb=1

M.A(A[52]) = 54360+2(52-1)

= 54360+2(51)

=54360+102

=54462

Q#2:

Design an algorithm to delete an element from a One Dimensional Array.

ANS : REQUIREMENT

1. if the last element of the list (Array) is to be deleted, then there is no problem .

2. if the top or any middle element is deleted then all the elements after that position will have to move one location backward.

3. there must be at least one element present in the array .

Dry steps :

1. item←A[K]

2. for (j←k to n-1)

Start-of-for-loop

(a) A[j]←A[j+1]

end-of-for-loop

3. n←n-1

4. exit

Where

***item** is the element to be deleted and it is on kth position of A[]

*j is counter variable of for loop

*n is the total number of element present in A[]

Deletion Operation

Deletion refers to removing an existing element from the array and re-organizing all elements of an array.

Algorithm

Consider LA is a linear array with N elements and K is a positive integer such that K<=N. Following is the algorithm to delete an element available at the Kth position of LA.

1. Start
2. Set J = K
3. Repeat steps 4 and 5 while J < N
4. Set LA[J] = LA[J + 1]
5. Set J = J+1
6. Set N = N-1
7. Stop

EXAMPLE :

Example 1 -

A[1]	a
A[2]	b
A[3]	c
A[4]	de
A[5]	ef
A[6]	f
A[7]	g
A[8]	

$K \leftarrow 4$

① item $\leftarrow$ A[K]

item $\leftarrow$ A[4] d

② for (J $\leftarrow$ K to n-1)

$j \leftarrow 4$ to 6^{7-1}

valid values. A[5]

loop will executed A[6]

$n \leftarrow 7$

$n-1 \leftarrow 6$.

③ $A[j] \leftarrow A[j+1]$ (④)

$A[4] \leftarrow A[4+1]$

A[5] e.

d is deleted.

④ $A[5] \leftarrow A[5+1]$

A[6] f

⑤ $A[6] \leftarrow A[6+1]$

A[7] g.

g is copied on location No 6.

End-of-for-loop.

⑥ $n \leftarrow n-1$

$7-1 \leftarrow 6$.

last g is not be considered.

Q#3:

Create an Algorithm for Binary Search.

ANS :

Dry Steps:

1. lb ←1

2. ub ←max

3. found ← false

4. while (lb<=ub)and (found = false)

Start-of-while-loop

a. mid ←(lb+ub)int-div2

b. if (item = A [mid])

then

found ← true

else

if (item < A[mid])

then

ub ← mid -1

else

lb ← mid +1

end-of-while-loop

5. if (found = true)

Then

display “search successful”

else

display “search unsuccessful”

6. Exit

Where

1. lb is the lower bound

2. ub is the upper bound

3. found is a Boolean variable or a variable with boollean behavior

4. mid is the middle of the current selected part of A[] 5. item is the element to

The pseudocode of binary search algorithms should look like this −

Procedure binary_search

A ← sorted array

n ← size of array

x ← value to be searched

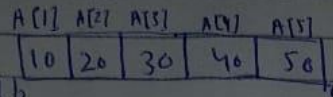
Set lowerBound = 1

Set upperBound = n

```
  while x not found
    if upperBound < lowerBound
      EXIT: x does not exists.

    set midPoint = lowerBound + ( upperBound - lowerBound ) / 2

    if A[midPoint] < x
      set lowerBound = midPoint + 1

    if A[midPoint] > x
      set upperBound = midPoint - 1

    if A[midPoint] = x
      EXIT: x found at location midPoint
  end while

end procedurec
```

Example

We have an array.



We search item ← 30

① lb ← 1

② ub ← 5

③ found ← false true ≠ false

④ while (lb <= ub) and (found = false)

→ lb 1 < 5 ✓ false = false ✓

Condition is true. loop may execute,

ⓐ mid ← (lb+ub)/2 ← (1+5)/2 ← 3

ⓑ if Citem = A[mid 3]

item we are 30

Search 30 = 30 ✓

then action will be perform.

→ found ← true

But found value is change to true

So loop is terminated

⑤ if (found = true)

true = true

So the

display Search Successfull.

THANK YOU