IQRA NATIONAL UNIVERSITY PESHAWAR

DEPTT. B.E. (ELECTRICAL)

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MID TERM EXAMINATION

DATA STRUCTURES AND ALGORITHMS

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Q#1. (a) Let the size of A [ ] be 15654 and the lower bound be 36767, calculate the upper bound.   (06)

> **Given Data:**

> > Size of A[ ]   = 15654

> > Lower bound "lb"   = 36767

> **To Find:**

> > Upper bound "ub"   = ?

> **Using Formula:**

> > Size of A [ ] = ub – lb + 1

> **Solution:**

> > Re-arranging the upper formula:

> > Ub = size of A [ ] + lb – 1

> > Putting the values

> > Ub = 15654 + 36767 – 1

> > $\boxed{\text{Ub} = 52420}$ Ans

(b) Suppose a list of 350 elements is to be sorted using Bubble Sort, then find
**   i. Total Number of Passes   (01)**
**   ii. Total Number of Steps   (01)**
**   iii. Number of Steps in Pass# 137   (01)**
**   iv. Number of Steps in Pass# 193   (01)**

> **Given Data:**

> > n = 350

i.   To Find:

> > Total Number of Passes = ?

> **Using Formula:**

> > n – 1

> **Solution:**

> > Total Number of Passes   =   n – 1

> putting values

> > > > =   350 – 1

> > > > = $\boxed{349}$ Ans

ii.   <u>**To Find:**</u>

         Total Number of Steps = ?

     <u>**Using Formula:**</u>

$$\frac{n\,(n-1)}{2}$$

     <u>**Solution:**</u>

Total Number of Steps	=	$\frac{n\,(n-1)}{2}$
	=	$\frac{350\,(350-1)}{2}$
	=	$\frac{350\,(349)}{2}$
	=	$\frac{122150}{2}$
	=	$\boxed{61075}$ Ans

iii.   <u>**To Find:**</u>

         Number of Steps in Pass# 137 = ?

     <u>**Using Formula:**</u>

         n – pass number

     <u>**Solution:**</u>

Number of Steps in Pass# 137	=	n – pass number
	=	350 – 137
	=	$\boxed{213}$ Ans

iv.   <u>**To Find:**</u>

         Number of Steps in Pass# 193 = ?

     <u>**Using Formula:**</u>

         n – pass number

     <u>**Solution:**</u>

Number of steps in Pass # 193	=	n – pass number
	=	350 – 193
	=	$\boxed{157}$ Ans

Q#2.   Sort the given list using Selection Sort.   (10)
         10, 15, 0, 7, 8, 6

Solution:

First find total number or steps:

No. of elements = 6

Total Steps   = Number of elements − 1

                  = 6 − 1

Total Steps   = 5

Now,

Step # 1:   Element = 10

Element # 1 = 10 , smallest element is 0 so these both will interchange with each others.

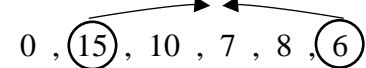$\overset{\frown}{(10)}$, 15 , (0) , 7 , 8 , 6

Now we get,

0 , 15 , 10 , 7 , 8 , 6

Step # 2:   Element = 15

Element # 2 = 15, smallest element in remaining elements is 6, so both will encircled and will be interchange with each others.

0 , (15) , 10 , 7 , 8 , (6)

Now we get,

0 , 6 , 10 , 7 , 8 , 15

Step # 3:   Element = 10

Element # 3 = 10, smallest element in remaining elements is 7, so both will encircled and will be interchange with each others.
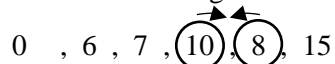
0 , 6 , (10) , (7) , 8 , 15

Now we get,

0 , 6 , 7 , 10 , 8 , 15

Step # 4:   Element = 10

Element # 4 = 10, smallest element in remaining elements is 8, so both will encircled and will be interchange with each others.

0 , 6 , 7 , (10) , (8) , 15

Now we get,

> 0 , 6 , 7 , 8 , 10 , 15

Step # 5:   Element = 10

Element # 5 = 10, smallest element in remaining elements is also 10, so it will be encircled but it will not be interchange because it is on its proper position.

> 0 , 6 , 7 , 8 , (10), 15

Now we get,

> 0 , 6 , 7 , 8 , 10 , 15

So, it will not be interchange because it is on its proper position. And the given list is sorted out by selection sort method.

Q#3. Fill in the blanks.   (10)

i.   **Physical** Data Structure may deal with only a single value.

ii. **Logical** Data Structure may deal with multiple values.

iii. The logical / mathematical organization of data is called **data structure**.

iv. A Tree is a **non-linear** Data Structure.

v.   An Array is a **linear** Data Structure.

vi. List must be sorted for **binary** searching.

vii. 17 int-div 2 = **8** .

viii. An investigation parade of criminals is an example of **Linear Search**.

ix. Number of Fields in a Record is called **Degree** .

x.   Number of Records in a Block is called **Block factor**.