No.1 Explain time and space complexity with example. 5 marks

Ans: In computer science, the time complexity of an algorithm quantifies the amount of time taken by an algorithm to execute. The time complexity of an algorithm is commonly expressed using big O notation.

Ex:

```
 int sum(int a[], int n)
{
        int s, i;
        s=0;
        for(i=0;i<n;i++)
        {   s=s+a[i];
        }
     return(s);
}
```

The function will take 4n+3 unit time. As there are 4 operations which will be repeated n times.

3 operations which are executed only once.

Space Complexity:

It is the total amount of space of computer memory required by an algorithm to complete its execution is called as space complexity. The space depends on the size of variables, constants, instructions etc.

Ex: In the above example space used by the code will be as follows:

 Total space=n+3

n-> no. of elements in the array

3 spaces for 3 variables n, s,i .

No.2 Write down the algorithm to insert an element into array. 5marks

Ans:

Insert(array,n,k,item)

1. Initialize the counter j=n-1
2. Repeat the steps 3 & 4 : while j >= k
3. Set array[j+1] = array[j]
4. Set j=j-1

(End of step 2 loop)

5. Set array[k] = item
6. Set n=n+1
7. Exit.

Where

array:- it is the array into which the element to be inserted

n:- size of the array

k:- it is the position at which the element is to be inserted

item:- data to be inserted

No.3

a) Write down the operations on the data structure.

Ans: Operations on data structure are:

Insertion, deletion, traversing, searching, sorting, merging

b) What is array? Explain with example.

Ans: Array:

It is a fixed sized, sequenced, collection of homogeneous data type. It is a derived data type. Syntax for array declaration is

data-type arraya-name[size];

Ex: int ar[10];

c) Explain row major order memory representation of 2D array.

Ans: In row major order elements of matrix are stored on a row by row basis.

Ex: Consider a 3X4 matrix

i.e int a[3][4];

$$\begin{bmatrix} a_{11} & a_{12} & a_{13} & a_{14} \\ a_{21} & a_{22} & a_{23} & a_{24} \\ a_{31} & a_{32} & a_{33} & a_{34} \end{bmatrix}$$

In row major order matrix will be stored as follows:

a11	a12	a13	a14	a21	a22	a13	a24	a31	a32	a33	a34

Memory location of a[m][n] = b + m* (No. of columns)* w + n * w

Where m- no. of rows

n- no. of columns

b- base address

w- word size

d) What is string? Explain with example.

Ans: A string is a null terminated character array. If we want to use a 10 character string then we must declare the array size as 11.

Ex: " Welcome to PNS"

Syntax for string is :

 char name[20];

e) What is a function? Write down types of function.

Ans: It is a set of statements that take input to do some specific computation and produces output. Function in C is of two types:

1.Library function: These are predefined functions. Ex printf, scanf, sqrt etc.

2. User defined function: These functions are defined by the user. Ex main function, other user defined function.