BCSL-045

uestion 1. Write and run the following programmes in C-language and calcula its total time complexity.

(i) Generate a fibonaci series of 10 numbers.

nswer:-

```
#include <stdio.h>
#include <conio.h>
void main ()
{ int a, b, c, i, n;
clrscr ();
a=55, b=89
Printf ("enter n for how many times generate the series");
Scanf ("%d", &n);
Printf (" FIBONACCI SERIES");
Printf (" \t%d, \t% d, a, b);
    for (i=0; i<n; i++)
{
 c=a+b;
  a=b ;
  b=c;
Printf ( "%d", c);
 }
getch();
 }
```

(ii) Find the largest number in an array.

nswer:-

```
#include <stdio.h>
#include <conio.h>
int main(){
int= [50], size,i, big ;
Printf ("/n Enter the size of the array");
Scanf ("%d ; & size);
Printf ("Enter %.d elements into the array: "size)
 For (i=e; i<size; i++)
Scanf ("%d ; & a[i]);
 big = a[0];
For (i=1; i<size; i++)
 {
if (big < a[i])
 big = a[i];
 }
~~if (big~~ Printf ("Largest element: %d", big);
return 0;
 }
```

iii) Find the GCD of two positive integers X and Y.

wer:-

```
#include <stdio.h>
#include <conio.h>
int main (){
int x, y, m, i;
Printf ("Insert any two number: ");
Scanf ("%d %d", &x, &y);
```

```
if (x>y)
 x=y;
else
  m=x;
For (i=m;i>=1;i--)
 {
if(x% i=0 && y% i==0){
Printf ("GCD of two number is ! %d", i);
break;
}
}
return 0;
 }
```

Question-2- Show how the following matrices should be multiplied using Strassen's algorithm.

$$X = \begin{bmatrix} 3 & 2 & 1 & 6 \\ 4 & 3 & 0 & 3 \\ 6 & 7 & 2 & 5 \\ 7 & 3 & 5 & 6 \end{bmatrix} \text{ and } Y = \begin{bmatrix} 3 & 6 & 1 & 7 \\ 5 & 6 & 4 & 3 \\ 2 & 3 & 2 & 1 \\ 6 & 4 & 3 & 2 \end{bmatrix}$$

Answer:- $z = xy$ $\qquad x, y, z \; R^{4 \times 4}$

$z, 1 = x_{1}, 1 \; y_{1}, 1 - 1, 2 \; y_{2}, 1$

$Z_{1}, 1 = x_{1}, 1 \; y_{1}, 1 + x_{2}, 2 \; y_{2}, 2$

Then there matrix product is exactly the same as the product of matrix.

$$\begin{pmatrix} x_{11} & x_{12} \\ x_{21} & x_{22} \end{pmatrix} \quad \& \quad \begin{pmatrix} y_{22} & y_{12} \\ y_{22} & y_{22} \end{pmatrix}$$

where we have,

$$x_{11} = \begin{pmatrix} 3 & 2 \\ 4 & 3 \end{pmatrix}, \qquad x_{12} = \begin{pmatrix} 1 & 6 \\ 0 & 3 \end{pmatrix}$$

$$x_{21} = \begin{pmatrix} 6 & 7 \\ 7 & 3 \end{pmatrix}, \qquad x_{22} = \begin{pmatrix} 2 & 5 \\ 5 & 6 \end{pmatrix}$$

$$y_{11} = \begin{pmatrix} 3 & 6 \\ 5 & 6 \end{pmatrix}, \qquad y_{12} = \begin{pmatrix} 1 & 7 \\ 4 & 3 \end{pmatrix}$$

$$y_{21} = \begin{pmatrix} 2 & 3 \\ 6 & 4 \end{pmatrix}, \qquad y_{22} = \begin{pmatrix} 2 & 1 \\ 3 & 2 \end{pmatrix}$$

$x_{11} = 9 - 8 \Rightarrow x_{11} = 1$

$x_{12} = 3 - 0 \Rightarrow x_{12} = 3$

$x_{21} = 18 - 49 \Rightarrow x_{21} = 31$

$x_{22} = 12 - 25 \Rightarrow x_{22} = -13$

$y_{11} = 18 - 30 \Rightarrow y_{11} = -12$

$y_{12} = 3 - 28 \Rightarrow y_{12} = -25$

$y_{21} = 8 - 18 \Rightarrow y_{21} = -10$

$y_{22} = 4 - 3 \Rightarrow y_{22} = 1$

So, $x = \begin{pmatrix} 1 & 3 \\ 31 & -13 \end{pmatrix}$ & $y = \begin{pmatrix} -12 & \cdot 25 \\ -10 & 1 \end{pmatrix}$

Question 3. Find out O (big O) notation for the following function.

$f(n) = 6n^2 + 7$

Answer:- $f(n) = 3n + 7$ I O (n)

Choose $k = 1$

Assuming $n > 1$, then

$$\frac{f(n)}{g(n)} = \frac{6n^2+7}{n^2} < \frac{6n^2+7n^2}{n^2} = \frac{13n^2}{n^2} = 13$$

Choose $C = 13$. Note that $7 < 7n^2$

Thus, $6n^2+7$ is $O(n)$ because $6n^2+7 \leq 13n^2$ whenever $n > 1$

Question 4. Find out Ω (big omega) notation for the following function.

$f(n) = 15n^2 + 5n$

Answer: $f(n) > c(g(n))$

$f(n) = 15n^2 + 5n$

Let c & $k > 0$ be such that $15n^2 + 5n > f(n)$

Or

$15n^2 + 5n > c(n)$

For all $n \geq k$

Then $C = 1$ & $K \geq 21$

So, $C = 1$ & $K > 21$ satisfy the last inequality.

Question 5. Find out θ (big theta) notation for the following function.

$$F(n) = 15n^2 + 5n$$

Answer:-

$$f(n) = 15n^2 + 5n$$

$$C = 9(x) \le f(x) \le C = 9(x)$$

for all $x \ge K$.

Note :- The last inequalities represent two condition to be satisfied simultaneously, viz.

$$C_2 9(n) \le F(x) \ \& \ F(n) \le C_2 9(x)$$

Let C & K

$$F(n) \le 15n^2 + 5n$$

$$C = 1 \quad K = 2.$$

Question 6. Write and run Quicksort programme and count number of exchange operations in the programme. Apply the programme for the following 8-element array and show the step by step output.

6, 3, 2, 8, 12, 11, 9, 10

Answer:-

```
# include < stdio.h >
# include < conio.h >
void quicksort (int a, int n) {
 if (n<2)
return ;
int P= a[n/2];
int l=a ;
int r = a + n-1;
while (K=r) {
```

```
if (l<p) {
 l++
Continous;
}
if (r>p) {
 r--
Continuous;
}
int t= *l;
*l++=*r;
*r--=t;
}
Quicksort (a,r-a+1);
Quicksort (l, a+n-1);
}
int main (){
int a[] = {6,3,2,8,12,11,9,10};
int n = Size of a / size a[0];
Quicksort (a,n);
return 0;
}
```