Institute of Business & Information Technology

University of the Punjab





Assignment 02

Fall Term 2021

Complexity of Recursive Functions

Code IT-466 Degree BBIT

Title Analysis of Algorithm Batch F18-IT Major

Due Date: Nov 26, 2021 before 1500hr Marks 110

Instructions:

- 1. Do not forget to pray before starting to attempt the paper. Trust me it helps.

 Remember! <u>SOMEONE</u> is always with you (Be Relaxed), and HE is also watching you (Be Honest)
- 2. Question Paper is SELF EXPLANATORY. Understanding the Question Paper is part of Solution.
- 3. Nothing Beyond the Finish Line will be Evaluated. Back Side of Pages is Beyond Finish Line.
- 4. For Calculations etc. Use the back side of the pages.
- 5. Error in Question will be advantageous to Student.
- 6. Read the Questions carefully before attempting.
- 7. Solve your paper using Black/Blue Pen only.
- 8. Attempt All Questions in a Precise Fashion.
- 9. Switch Off your Cellular Phones.
- 10. Manage Your Time.

GOOD LUCK

Reg. No:	Name:
Class: IT Specialization	Date: Monday, Nov 22, 2021
Section:	Signature:

Q 01.	Q 02.	Q 03.	Q 04.	Q 05.	Q 06.	Q 07.	Q 08.	Q 09.	Q 10.	Total
10	25	15	15	10	10	10	15			110

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Assistant's Signature		Examiner's Signature

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Question No 01.
                                                                                   10
Write the Time Equation for the following Recursive Functions
                                                                                 2 \times 5
void doit(int n){
   if (n==1)
       return;
   for (i=0; i<n; i++)
       x = x + i;
   doit(n/2);
   doit(n/2);
}
void doit(int n){
   if (n==1)
       return;
   X++;
   doit(n/2);
   doit(n/2);
}
void doit(int n){
   if (n==1)
       return;
   for (i=0; i<n; i++)
       x = x + i;
   doit(n/2);
}
public static int power(int x, int n ){
   if (n == 0)
       return 1;
   else
       return (x * power (x, n-1));
}
public static int sum(int n){
   if (n == 1)
       return 1;
   else
       return n + sum(n - 1);
```

}

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Question No 02.	25
Write the Recursive Functions for the following tasks To Compute the Sum of Digits of a Decimal Number	5 × 5
Insertion Sort	
Binary Search Algorithm	

Reverse a Linear Linked List		
Check a word is Palindrome		

Question No 03. Arrange the following function by decreasing order of growth?	25
Arrange the following function by decreasing order of growth? $f_1 = nlog^2 n \qquad f_2 = n^{\sqrt{logn}} \qquad f_3 = 2^{log^2 n}$,
Find the Space Complexity $S(n)$ of the Following Iterative Algorithms, Show Working.	
Func(A, m, n)	4
int X[n,m], int i,j for(i=1; i<=m; i++)	
for(j=1; j<=n; j++)	
X[i,j]=A[j,i]	
Func()	4
int X[n]	
int Y[n,n]	
for(int a=1; a<=n; a++) for (int b=1; b<=n; b++)	
Y[a,b]=X[a]+X[b]	
	_
	·

Question No 04.	15
Find the Space Complexity $S(n)$ of the Following Recursive Algorithms, Show Working. DT(int n)	5
if (n==1)	9
return;	
DT(n/2);	
DT(n/2);	
$S(n) = 3S(n-2) + n^2$	5
Func()	5
int X[m,n,p]	`
int i=1, j=1, k=1	
while(i<=m)	
j=1	
while(j<=n)	
k=1	
while (k<=p)	
Read X[i,j,k]	

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Question No 05. Find the Time Complexity of the Following F	Recursive Algorithms using Recursion Tree, Show Working. $T(n) = 5T\left(rac{n}{5} ight) + cn^5$	10

November 2021

This the Time Complexity of the Alg	orithm with following time equation using Recursive Tree $T(n) = 2 \ T\Big(\frac{n}{2}\Big) + n^2$	

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Question No 07. Find the Time and Space Complexity of the Algori	15 10+5	
Find the Time and Space Complexity of the Algorithm $\mathbf{T}(\mathbf{n}) = \mathbf{T}(\mathbf{n})$	$-16 T \binom{n}{n} + n^2$	1010
I(II) -	$= 10 \text{ f} \left(\frac{4}{4}\right) + \text{ fi}$	

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Agents layer Ag	Name	

Find the Time Complexity of the Algorithm with following time equation using Recursive Tree $T(n) = 3 \ T\left(\frac{n}{3}\right) + cn^3$	
\ J '	
Finish Line	

Nothing beyond this line will be evaluated