Total No. of Questions—**12**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4457]-114

S.E. (Computer) (First Semester) EXAMINATION, 2013

DATA STRUCTURES AND ALGORITHM

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Explain the tower's of Hanoi problem with suitable example. [8]

(*b*) Given an array of size 'n' containing integers sorted in descending order. Write 'C' function for the following : [8]

(1) To search a given number in an array using recursion.

(2) To search a given number in an array without using recursion.

P.T.O.

Or

2. (*a*) Suppose you are given an array s[1.....n] and a procedure reverse (s,i,j) which reverses the order of elements in a between positions i and j (both inclusive). What will be the output of the following sequence of stamen if s[] = 100011. Show step by step change in s.

1. while (1 < k <= n)

1.1 reverse (s, 1, k);

1.2 reverse (s, k + 1, n);

1.3 reverse (s, 1, n); [4]

(*b*) Comparison between recursion and iteration. [4]

(*c*) Define the following terms : [8]

(1) Data Structures

(2) Data Objects

(3) Ephemeral Data Structures

(4) Persistent data structure.

3. (*a*) What is the frequency count of the following :

```
float avg(int a[10], int n)
{
int s = 0;
float avg;
for(int i=1;i<=n;i++)
    s+=a[i];
avg = s/n;
return(avg);
}
```

Find out time complexity. [5]

(*b*) Write 'C' functions for insertion sort. What is its time complexity ? [5]

(*c*) State whether it is correct or incorrect. Justify your answer : [6]

(1) $10n^2 + 9 = O(n)$

(2) $n! = O(n^n)$

(3) $3n + 6 = O(n)$

Or

4. (*a*) What is Abstract Data Type ? Write an ADT for String. [6]

(*b*) Write an algorithm for addition of two matrices and find out its time complexity and space complexity. [8]

(*c*) What is a Theta Notation asymptotic notation ? [2]

5. (*a*) Write an ADT for sparse matrix. Write an algorithm for sparse matrix addition. [10]

(*b*) What is column major and row major representation methods of an array ? Derive the address calculation formula for both methods. [8]

Or

6. (*a*) What is sparse matrix ? Write an algorithm to find fast transpose of sparse matrix and list out the advantages of fast transpose over simple transpose. [12]

(*b*) Write an ADT for polynomial. [6]

SECTION II

7. (*a*) Sort the following numbers step by step by using quick sort : Also comment on time complexity of quick sort in best case, worst case and average case.

5, 3, 8, 9, 1, 7, 10, 2, –6, 4. [10]

(*b*) Write an algorithm for radix sort. [6]

Or

8. (*a*) Write and explain with example algorithm for shell sort. What is time complexity of shell sort ? [8]

(*b*) Write an algorithm for Binary Search. Explain its best case, worst case and average case complexity with example. [8]

9. (*a*) Write pseudo code to sort singly linked lists of string data. Analyze time complexity of this code. [8]

(*b*) Write a node structure for Generalized linked list. Show graphical representation for the following GLL : [8]

(a, b, (d, (e, f), g, (h, ( ), l), m))

Or

10. (*a*) Write and explain a node structure to represent polynomial using GLL. What are the advantages of using GLL for polynomial representation ? [8]

(*b*) Write a function to perform addition of two polynomial using Circular linked list. Explain time complexity of it. [8]

11. Write short notes on : [18]

(*a*) Queue Application

(*b*) Concept of skip list

(*c*) Double ended queue and its primitive operations.

Or

12. (*a*) Write an algorithm to convert postfix expression to infix expression. Comment on its time complexity. [8]

(*b*) Convert the following infix expression to prefix expression and evaluate the prefix expression with the following values : [10]

(a + (b * c)/e ^ f – (g * h))

A = 10, b = c = 4, e = 2, f = 3, g = 1, h = 5