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**S.E. (Computer) (I Sem.) EXAMINATION, 2015
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) What is recursion ? Explain with example. What are its advantages and disadvantages ? [8]
- (b) Explain with example primitive functions for file handling in C. [10]

Or

2. (a) Suppose you are given an array $s[1\dots n]$ 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 . [4]
 1. while ($1 < k \leq n$)
 - 1.1 reverse ($s, 1, k$);
 - 1.2 reverse ($s, k + 1, n$);
 - 1.3 reverse ($s, 1, n$);

P.T.O.

(b) Write a recursive function for the following and show step by step function call $f(5)$:

$$\begin{aligned} f(n) &= n && \text{if } n = 0, 1 \\ &= f(n - 1) + f(n - 2) && \text{otherwise.} \end{aligned} \quad [8]$$

(c) Explain pass by value and pass by reference parameter passing to function with example. [6]

3. (a) State whether it is correct or incorrect. Justify your answer.

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

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

(3) $3n + 6 = O(n)$. [6]

(b) What is the frequency count of the following :

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

Find out time complexity. [5]

(c) Write 'C' functions to display transpose of a matrix. What is its time complexity ? [5]

Or

4. (a) Write an algorithm for multiplication of two matrices and find out its time complexity and space complexity. [10]

(b) Explain asymptotic notation. [6]

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. [6]

Or

6. (a) What is sparse matrix ? Write an algorithm to find simple transpose of sparse matrix. Compare fast transpose and simple transpose method. [10]
- (b) Write an ADT for polynomial. Write algorithm for polynomial evaluation. [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, 12, 7, 10, 2, -6, 1. [10]
- (b) Write an algorithm for shell sort. [6]

Or

8. (a) Write and explain with an example algorithm for radix sort.
What is time complexity of radix sort ? [6]
- (b) Write an algorithm for Binary Search. Explain its best case, worst case and average case complexity with example. [10]

9. (a) Write pseudo code to reverse 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 :

- (1) Stack application
- (2) Josephus problem
- (3) Double ended queue and its primitive operations. [18]

Or

12. (a) Write an algorithm to convert prefix expression to infix expression. Comment on its time complexity. [8]
- (b) Convert the following infix expression to postfix expression and evaluate the postfix expression with the following values : [10]

$$(a + (b * c)/e ^ f - (g * h))$$

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