

Total No. of Questions—12]

[Total No. of Printed Pages—4+1

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[4657]-73

S.E. (Computer) (First Semester) EXAMINATION, 2014

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 ? What are its advantages and disadvantages ? [6]
- (b) Explain with example fwrite, ftell, fseek functions for file handling in C. [6]
- (c) Write a recursive function for the following : [4]

$$f(n) = n, \text{ if } n = 0, 1$$
$$= f(n) * f(n/2) \text{ otherwise.}$$

P.T.O.

Or

2. (a) What is user defined data types and built-in data types ?
Explain with example. [5]

(b) Write a recursive function for the following and show step
by step function working for $f(5)$: [8]

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

(c) Write differences in binary mode and text mode of a file. [3]

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

```
int fact(int n)
{
    if(n==1)
    {
        return(1);
    }
    else
        return(n*fact(n-1));
}
```

Find out time complexity. [6]

(b) Write 'C' functions to perform multiplication of two matrix.
What is its time complexity ? [6]

(c) Explain any *two* Asymptotic notations with example. [4]

Or

4. (a) Write an ADT for an Array. [4]
- (b) Write pseudocode for addition of two matrices and find out its frequency count. [8]
- (c) What do you mean by space and time complexity ? Explain with an example. [4]
5. (a) Explain concept of sparse matrix with example. Compare it with normal matrix. [6]
- (b) Explain how two-dimensional array $A[1 : m, 1 : n]$ is represented in computer memory using row major and column major representation. Explain formula using both methods for computing the address of any element $A[i, j]$ where [12]
- $$1 \leq i \leq m \text{ and } 1 \leq j \leq n.$$

Or

6. (a) Write ADT for sparse matrix. Write an algorithm to find simple transpose. [12]
- (b) Write a 'C' function to implement polynomial addition using array. Explain time complexity for above function. [6]

SECTION II

7. (a) Sort the following numbers step by step by using radix sort. Also comment on how many passes and comparisons required in radix sort :
655, 307, 8, 99, 11, 75, 101, 2023, -6, 04. [10]
- (b) Write an algorithm for merge sort. [6]

Or

8. (a) What do you mean by stable sorting method ? Explain Quick sort method and comment on its stability. [8]
- (b) Write an algorithm for linear search. Explain its best case, worst case and average case complexity with example. [8]
9. (a) Write pseudocode to reverse singly linked list. [4]
- (b) Write a node structure for Generalized linked list in 'C'. Explain use of union in it. Show Graphical representation for the following GLL : [12]
(1, 2, (3, (4), 5, (6, 7), 8), 9).

Or

10. (a) Write a function to perform multiplication of two polynomial using circular linked list. Explain time complexity of it. [12]
- (b) Write and explain node structure in C to represent polynomial using GLL. [4]

11. (a) Write an algorithm to convert prefix expression to postfix 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]

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

$$a = 10, b = c = 4, e = 2,$$

$$f = 3, g = 5, h = 1.$$

Or

12. Write short notes on : [18]
- (a) Stack application
- (b) Different types of Queue
- (c) Multistack.