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**[3762]-604**

**S.E. (Comp.) (I Sem.) EXAMINATION, 2010**

**DATA STRUCTURES AND ALGORITHMS**

**(2003 COURSE)**

**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) Neat diagrams must be drawn wherever necessary.
  - (iv) Figures to the right indicate full marks.
  - (v) Assume suitable data, if necessary.

**SECTION I**

1. (a) Explain the following terms with an example :

(i) Data

(ii) Data Object

(iii) Data Types

(iv) Abstract Data Types (ADT).

[8]

(b) Explain the program development steps in detail.

[8]

P.T.O. —

Or

2. (a) Write an algorithm, flow chart, pseudocode and 'C' program to find the largest number from the array of size 'n'. [8]
- (b) Explain with an example, static and dynamic data structures. [8]
3. (a) Explain how arrays are represented in computer memory using Row Major representation and obtain a formula to compute address of an element in 2-dimension array. [8]
- (b) Write pseudo 'C' code to multiply two polynomials. [8]
- (c) What is sparse matrix ? [2]

Or

4. (a) Write pseudo 'C' code to compute fast transpose of a sparse matrix. Obtain time complexity of your algorithm. [10]
- (b) Write pseudo 'C' code for the following :
- (i) addition of two matrices
  - (ii) multiplication of two matrices
  - (iii) transpose of a given matrix
  - (iv) to check whether given matrix is an identity matrix. [8]
5. (a) Implement stack as an ADT using array. [8]
- (b) Write pseudo 'C' code to convert a given infix expression to its post fix form. [8]

Or

6. (a) Write short note on multi-stack. State any *two* applications of multi-stack. [6]
- (b) Write pseudo 'C' code to reverse a given string and to check whether it is a palindrome. [6]
- (c) Write short note on applications of stack. [4]

## SECTION II

7. (a) Implement queue as an ADT using array. [8]
- (b) Compare linear queue with circular queue. [4]
- (c) Explain Josephus problem. How it can be solved using queue ? [4]

Or

8. (a) Implement doubly ended queue as an ADT using array. [8]
- (b) Explain in detail the drawbacks of linear queue using an array. How these drawbacks can be resolved ? [8]
9. (a) Write pseudo 'C' code for selection sort. Write down frequency count for each step and compute total frequency count. What is time complexity of your algorithm in worst case ? [8]
- (b) Write pseudo 'C' code for binary search and obtain time complexing of your algorithm. [6]
- (c) What do you understand by 'sort stability' ? Is quick sort stable ? [4]

*Or*

10. (a) Analyse bubble sort for best and worst cases and obtain its time complexity for best and worst case input. [8]
- (b) Write pseudo 'C' code for sequential sort and obtain its time complexity in best and worst cases. [6]
- (c) Why do we need to sort data ? [4]

11. (a) Define the following asymptotic notations :
- (i) Big 'O'
- (ii) Big ' $\Omega$ '
- (iii)  $\Theta$  notations. [6]
- (b) Explain 'Divide and Conquer' strategy of algorithm using the example of 'Tower of Hanoi'. [6]
- (c) Explain why frequency count is important in 'Analysis of algorithms'. [4]

*Or*

12. (a) Analyse binary search algorithm for its time and space complexity (Best and Worst). [6]
- (b) Write short note on backtracking algorithmic strategy. [6]
- (c) Compare sequential search with binary search with reference to time and space complexity. [4]