Exam. Code : 103204
Subject Code : 1088

B.A./B.Sc. 4th Semester

COMPUTER SCIENCE

(Data Structures & Programming Language Using C++)

Time Allowed—Three Hours] [Maximum Marks—75

Note :— Attempt any **FIVE** questions. All questions carry equal marks.

1. (a) What are the parameters to judge the efficiency of an algorithm ? Explain various notations for representation of time complexity of an algorithm.

   (b) What is a Data Structure ? What are the factors that influence the choice of a particular data structure ? 8,7

2. (a) How are arrays represented in memory ? A 3-dimensional integer array X [4] [5] [3] is stored using the column major order. What will the address of X [2] [3] [1] be if the base address is 100 ? Also, calculate the address if the array is stored using row-major order.

(b) Give an efficient algorithm (smallest number of comparisons) which finds the maximum element and the minimum element in an input (unsorted) array A[1..n]. Clearly and briefly describe your algorithm (not the program) first. Then give its number of comparisons in terms of the size of the array. 8,7

3. (a) Differentiate between singly linked list and doubly linked list. Write algorithm to insert and delete elements in a singly linked list.

(b) Write a 'C++' program to reverse a linked list. 8,7

4. (a) Write an algorithm for push, pop and empty operations on stack.

(b) Write an algorithm for evaluating postfix expression. Show the working of your algorithm on the following expression : (10, 8, +, 12, 9, 5, /, +, *). 8,7

5. (a) What is a linear queue ? Write an algorithm for adding an element to a linear queue. How is circular queue better than linear queue ?

(b) Can a queue be represented by circular linked list with only one pointer pointing to the tail of the queue ? Substantiate your answer using an example. 8,7

6. (a) How is binary search different from search ? Write the binary search algorithm and give its time complexity.

   (b) Write an algorithm for 2-way merge sort. Sort the following numbers and show all intermediate steps : 7, 19, 39, 5, 72, 115, 13, 44, 56. 8,7

7. (a) Identify the key principles in object-oriented programming (OOP) and compare them with procedural programming paradigm.

   (b) What are constructors and destructors ? How are these methods programmed and called ? Write one simple class with some pointer to integers and constructor and destructor for allocating and releasing its memory. Other methods are not required. 8,7

8. Define the term inheritance and give an example using C++ Programming language. What are the different forms of inheritance supported in C++ ? Discuss on the visibility of the base class members in privately and publicly inherited classes. 15