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**Question Paper Code: 41233**

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2016

Third Semester

Electronics and Communication Engineering

14UCS323 - DATA STRUCTURES AND ALGORITHM ANALYSIS

(Regulation 2014)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

- For a method to be an interface between the outside world and a class, it has to be declared
  - Private
  - Public
  - Protected
  - Static
- In which case is it mandatory to provide a destructor in a class?
  - Almost in every class
  - Class for which two or more than two objects will be created
  - Class for which copy constructor is defined
  - Class whose objects will be created dynamically
- Assume that we have constructor functions for both base class and derived class. Now consider the declaration in main( ). `Base * P = New Derived;` in what sequence will the constructor be called
  - Derived class constructor followed by Base class constructor
  - Base class constructor followed by derived class constructor
  - Base class constructor will not be called
  - Base class constructor will not be called
- Function templates can accept
  - Any type of parameters
  - Only one parameter
  - Only parameters of the basic type
  - Only parameters of the derived type

5. The postfix form of  $A*B+C/D$  is
  - (a)  $*AB/CD+$
  - (b)  $AB*CD/+$
  - (c)  $A*BC+/D$
  - (d)  $ABCD+/*$
6. The goal of hashing is to produce a search that takes
  - (a)  $O(1)$  time
  - (b)  $O(n^2)$  time
  - (c)  $O(\log n)$  time
  - (d)  $O(n \log n)$  time
7. The number of leaf nodes in a complete binary tree of depth  $d$  is
  - (a)  $2^d$
  - (b)  $2^{d-1} + 1$
  - (c)  $2^{d+1} + 1$
  - (d)  $2^{d+1}$
8. The data structure required for Breadth First Traversal on a graph is
  - (a) queue
  - (b) stack
  - (c) array
  - (d) tree
9. Which of the following sorting procedure is the slowest?
  - (a) Quick sort
  - (b) Heap sort
  - (c) Shell sort
  - (d) Bubble sort
10. Which of the following uses memorization?
  - (a) Greedy approach
  - (b) Divide and conquer approach
  - (c) Dynamic programming approach
  - (d) Backtracking

PART - B (5 x 2 = 10 Marks)

11. What are the special characteristics of a friend function?
12. Differentiate between function template and function overloading.
13. Define binary heaps and write its properties.
14. Draw a binary Tree for the expression :  $A * B - (C + D) * (P / Q)$ .
15. State the Master theorem and its use.

PART - C (5 x 16 = 80 Marks)

16. (a) (i) Explain the features of object oriented programming. Describe how each of these is implemented in C++. (8)
  - (ii) Write a program to calculate the area of circle, triangle, and rectangle using function overloading. (8)
- Or
- (b) (i) How is a class converted into another class? Explain with one example. (10)
  - (ii) Discuss briefly about copy constructor. (6)

17. (a) Discuss the various types of inheritances with suitable examples. (16)

Or

(b) (i) Discuss briefly about the function template with example. (8)

(ii) Write a program to read three numbers  $x$ ,  $y$  and  $z$  and evaluate  $R$  given by  $R = z / (x - y)$ . Use exception handling to throw an exception in case division by zero is attempted. (8)

18. (a) (i) Write a program to perform the operations of stack using array. (8)

(ii) Write an algorithm to convert infix to postfix expression and explain it with an example. (8)

Or

(b) (i) Discuss briefly about Perculate-Up and Perculate-Down operations in binary heaps. (6)

(ii) Given input {4371,1323,6173,4199,4344,9679,1989} and a hash function  $h(X) = X \bmod 10$ , show the resulting: (a) Separate chaining table (b) Open addressing hash table using linear probing (c) Open addressing hash table using quadratic probing (d) Open addressing hash table with second hash function  $h_2(X) = 7 - (X \bmod 7)$ . (8)

19. (a) (i) Write a program in C to create an empty binary search tree and search for an element  $X$  in it. (8)

(ii) Explain in detail (i) Single rotation (ii) double rotation of an AVL tree. (8)

Or

(b) (i) Discuss briefly about the various graph traversals. (8)

(ii) Discuss briefly about topological sorting. (8)

20. (a) Write a program to Quick sort. Consider a list of numbers 9, 20, 6, 10, 14, 8, 60, 11 given. Sort them using Quick Sort. Give step wise calculation. (16)

Or

(b) Explain in detail about Divide and conquer algorithm with an example also mark the difference between Greedy and divide and conquer algorithm. (16)

