No of Pages : 2 Course Code : 15XW23

Roll No:

(To be filled in by the candidate)

PSG COLLEGE OF TECHNOLOGY, COIMBATORE - 641 004 SEMESTER EXAMINATIONS, AUGUST / SEPTEMBER - 2016

MSc – SOFTWARE SYSTEMS Semester: 2

15XW23 DATA STRUCTURES AND ALGORITHMS

Time: 3 Hours Maximum Marks: 100

INSTRUCTIONS:

- 1. Answer **ALL** questions from GROUP I.
- 2. Answer any **FIVE** questions from GROUP II.
- 3. Answer any **ONE** question from GROUP III.
- 4. Ignore the box titled as "Answers for Group III" in the Main Answer Book.

GROUP - I

Marks: $10 \times 3 = 30$

Find the running time of the following program segment in Big-Oh notation.

- 2. Which data structure is used to perform recursion? Why?
- Consider the following programming tasks:
 - Maintain a waiting list for reservations at a hotel. Rooms are assigned on a firstcome, first served bases.
 - II) Maintain a list of violin players who auditioned for a major orchestra. The players were ranked during their auditions, and the top-ranked player will get offered any job that opens up.
 - III) Attempt to find an escape route for a mouse in a maze. The mouse should be able to retrace its steps while attempting to escape.
 - IV) Store the recent moves in a chess game, so that it can be used to check conditions for movement and check mate.

Which data structure you will select for the above applications? Justify your selection.

4. Consider the stack 's' and queue 'q'. Assume that 's' is initially empty and that 'q' initially contains the following data.



Consider the following code segment.

while (!q.isEmpty())
 s.push(q.remove());
while (!s.isEmpty())
 q.insert(s.pop());

After executing the above code, what are the contents of s and q?

No of Pages : 2 Course Code : 15XW23

5. What is multiply linked list? How it is useful in representing sparse matrices?

- 6. Mention any two advantages of circular linked list over singly linked list.
- 7. Given the following inorder and preorder traversals, trace the binary tree.

Inorder traversal : B F G H P R S T W Y Z

Preorder traversal: P F B H G S R Y T W Z

- 8. Why quick sort is considered to be best in case of large input data set, when compared with bubble sort, insertion sort and selection sort?
- 9. What is Huffman tree? Give an example.
- 10. What is a threaded binary tree? Give an example.

GROUP - II

Marks: $5 \times 10 = 50$

11. Explain the quick sort procedure step by step by considering the following input

Also derive the best case and worst case time complexity for quick sort.

12. Implement a stack S of n elements using arrays. Write functions to perform PUSH and POP operations. Also write a routine to Implement the query "Retain only the elements in the odd position of the stack and pop out all even positioned elements"

(eg) Stack S Output Stack S Elements: a b c d a c Position: 1 2 3 4 1 2

- 13. Write an algorithm to perform the following operations in a singly linked list.
 - Delete every second element from a list.
 - Return the number of elements in the list.
- 14. Write an algorithm to convert infix expression to postfix expression. Trace the algorithm for the following expression.

((A+B*C/D)*(E/F/G)/H)

- 15. Write algorithms to determine
 - number of nodes in a binary tree.
 - the sum of contents of all the nodes in a binary tree.
- 16. What is circular queue? Write algorithms to perform insertions and deletions on a circular queue.

GROUP - III Marks : $1 \times 20 = 20$

17. Explain different methods of handling collisions in hash table. Given a hash table with b = 11 buckets, and the hash function f(k) = k modulo b, using linear probing start with an empty hash table and insert elements whose keys are in the order given below.

15 9 20 22 28 31 12 29 23

Draw the hash table following each insertion.

18. A deque is an ordered set of items from which items may be deleted at either end and into which items may be inserted at either end. Call the two ends of a deque as left and right. How can a deque be represented as a C array? Also write the routines to insert elements at the right and left ends of a deque.

FD/RL /END/