

**DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY,
LONERE - RAIGAD -402 103
Winter Semester Examination - December - 2019**

Branch: B. Tech in Computer Engineering
Subject (Subject Code):- Data Structures (BTCOC303)
Date:-14/12/2019

Sem.:- III
Marks: 60
Time:- 3 Hrs.

Instructions to the Students

1. Each question carries 12 marks.
2. Attempt any **FIVE** questions
3. Illustrate your answers with neat sketches, diagrams etc., wherever necessary
4. If some part or parameter is noticed to be missing, you may appropriately assume it and should mention it clearly

Q1. Solve any THREE of the following questions. (3x4 = 12)

- a) Why to study data structures? What are the major data structures used in the RDBMS, Network and Hierarchical data model.
- b) Consider the following specification of a graph $G = (V, E)$.
 $V = \{1, 2, 3, 4\}$
 $E = \{(1, 2), (1, 3), (3, 3), (3, 4), (4, 1)\}$
 - i) Draw an undirected graph.
 - ii) Represent graph G using adjacency matrix.
 - iii) Represent graph G using adjacency linked list.
- c) Suppose the numbers: 50, 15, 62, 5, 20, 58, 91, 3, 8, 37, 60, 24 are inserted in order into an initially empty binary search tree. What is preorder, inorder and postorder traversal sequence of the tree?
- d) What is garbage collection? Who will run garbage collection program? When it will be run?

Q2. Solve all the following questions. (4x3 = 12)

- a) What is sparse matrix ? Convert the following sparse matrix into non-sparse matrix.

1 0 0 0

0	-2	11	0
0	0	0	0
0	6	0	5

- b) Suppose multidimensional arrays A and B are declared using **A (-1:3, 2:6) and B (1:5, -3:1)**. Find the length of each dimension and the number of elements in A and B.
- c) What is header linked list? Use header linked list to store the following polynomial.

$$p(x) = 2x^8 - 5x^7 + 3x^2 + 4$$
- d) What is hash data structure? The keys: **32, 18, 23, 2, 3, 44, 5 and 15** are inserted into an initially empty hash table of length 10 with hash function $H(\text{key}) = \text{key} \bmod 10$ and linear probing is used to resolve collision. What is hash table content after every key insertion?

Q3. Solve any THREE of the following questions. (3x4 = 12)

- a) Give an algorithm to implement binary search with its advantages and disadvantages.
- b) Explain the concept of skip list with an example. Give its advantages and disadvantages.
- c) Sort the following list using radix sort. Show all the passes neatly.
3 45 7 18 9 4 89 103 11 21
- d) Suppose we are sorting an array of eight integers using quick-sort, and we have just finished the first partitioning with the array looking like this: **2, 5, 1, 7, 9, 12, 21, 30**. What was the pivot element in the first partition? Also complete the rest of the partitions so that all numbers will be in the ascending order.

Q4. Solve any TWO of the following questions (2x6 = 12)

- a) Write an algorithm to insert a new node at the beginning of the singly linked list.
- b) What is singly circular linked list? Write an algorithm to traverse the list and also enlist different operations performed on it and

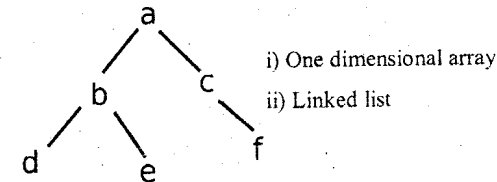
- c) Write a short note on dynamic storage management. Explain how it is done in C.

Q5. Solve any TWO of the following questions (2x6 = 12)

- a) Consider the stack, where $N = 6$ memory cells allocated. Suppose initially stack contains **A, D, E, F, G** (Top of stack). Then the following operations called in order. Show the stack top and any other situation raised while doing each of the operations.
- | | | |
|--------------------|----------------------|---------------------|
| i) Push(stack, K) | ii) Pop(stack, Item) | iii) Push(stack, L) |
| iv) Push(stack, S) | v) Pop(stack, Item) | vi) Push(stack, T) |
- b) What is queue? Write an algorithm to implement insert item into queue using singly linked list.
- c) Write an algorithm to evaluate postfix expression using stack and execute your algorithm with postfix expression **10, 5, 6, *, +, 8, /**. Show intermediate stack content after each operation.

Q6. Solve all of the following questions. (4x3 = 12)

- a) Give the characteristics of good algorithm. Also explain how do we analyze the algorithm.
- b) Store elements of the given below binary tree using



- c) What is an Abstract Data type (ADT)? Explain, why queue is called ADT?
- d) Explain the following graph terminology with figure
- | | |
|---------------------|----------------------------|
| i) Undirected graph | ii) Total degree of vertex |
| iii) Simple path | iv) Cycle |

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