

Please check that this question paper contains 09 questions and two printed pages within first ten minutes.

[Total No. of Questions: 09]

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Uni. Roll No.

MORNING

Program: B.Tech. (Batch 2018 onwards)

11 MAY 2023

Semester: 3rd

Name of Subject: Data Structures

Subject Code: PCIT-101

Paper ID: 16040

Scientific calculator is Allowed

Time Allowed: 03 Hours

Max. Marks: 60

NOTE:

- 1) Parts A and B are compulsory
- 2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice.
- 3) Any missing data may be assumed appropriately

Part – A

[Marks: 02 each]

Q. 1

- a) Define the time complexity of an algorithm.
- b) Explain the storage of sparse matrices.
- c) Apply two-way threading with a header-node in a tree.
- d) Describe the need of hashing.
- e) Analyze the features that make a graph as a multigraph.
- f) Differentiate between Adjacency Matrix and Adjacency List.

Part – B

[Marks: 04 each]

Q. 2 Apply Shell Sort algorithm to sort the following data in ascending order:-

54, 26, 93, 17, 77, 31, 44, 55, 20

- Q. 3 Demonstrate the use of stack data structure to convert the following infix expression into postfix expression:-

$$a + b * c + (d * e + f) * g$$

- Q. 4 Explain the various techniques that can be used to handle the problem of collisions in hashing.
- Q. 5 Analyze and compare the mechanisms to implement priority queue.
- Q. 6 Defend the statement that a B-tree makes an m-way search tree as a balanced tree by maintaining a height close to $\log_m(n+1)$.
- Q. 7 Design an algorithm for implementing stack using linked list and explain its working.

Part – C

[Marks: 12 each]

- Q. 8 Demonstrate the implementation of a recursive algorithm to solve Tower of Hanoi problem involving three disks.

OR

Describe the implementation of doubly-linked list and explain how a node is added and removed from it.

- Q. 9 Construct an AVL tree by inserting following numbers in an empty AVL tree:-

50, 20, 60, 10, 8, 15, 32, 46, 11, 48

OR

Compare the graph-traversal-techniques of Breadth First Search (BFS) and Depth First Search (DFS).
