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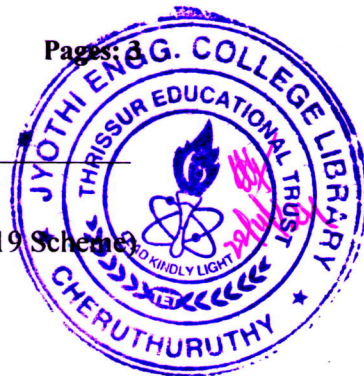
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Reg No.: _____

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Seventh Semester B.Tech Degree (R, S) Examination November 2024 (2019 Scheme)



Course Code: RAT 401

Course Name: ALGORITHMS AND DATA STRUCTURES

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

Marks

- 1 Differentiate between Big-O, Omega, and Theta notations in the context of algorithm analysis. (3)
- 2 Define data structures. With a neat diagram, explain the classification of data structures with examples. (3)
- 3 Define Sparse matrix. For the given sparse matrix, give the linked list representation: (3)

$$A = \begin{bmatrix} 0 & 0 & 3 & 0 & 4 \\ 0 & 0 & 5 & 7 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 2 & 6 & 0 & 0 \end{bmatrix}$$

- 4 List out the applications of stack. (3)
- 5 Define Binary tree. Explain the representation of a binary tree with a suitable example. (3)
- 6 Explain the in-degree and out-degree of a graph? Discuss the concept with an example. (3)
- 7 Differentiate between Hash table and Dictionary. (3)
- 8 Differentiate between internal and external sorting algorithms. (3)
- 9 Explain the concept of backtracking. (3)
- 10 Explain branch and bound technique. (3)

PART B

Answer any one full question from each module, each carries 14 marks.

Module I

- 11 a) Explain the concept of recursion in detail. With necessary examples, explain different types of recursive algorithms. (8)

- b) Differentiate between primitive and non-primitive data structures. (6)

OR

- 12 a) Mention various methods for solving recurrence relation. Explain substitution method for recurrence relation in detail. (6)

- b) With suitable example discuss various operations in data structures. (8)

Module II

- 13 a) Write an algorithm to implement push and pop operations for stacks using arrays. (6)

- b) Write an algorithm to convert infix expression to postfix expression. Convert the following infix expression into postfix expression using stack: (8)

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

OR

- 14 a) Write an algorithm/pseudocode to implement the following functions on single linked list. (8)

a) Insert a node at end.

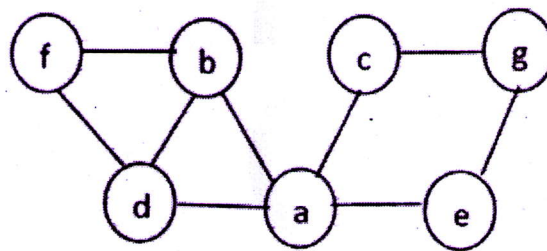
b) Delete a node from the beginning.

- b) Explain the different types of linked list. Explain the advantages of linked list over arrays. (6)

Module III

- 15 a) Design an algorithm to traverse a graph using Depth First Search (DFS). (8)

Apply DFS for the graph given below.



- b) Illustrate with necessary examples the various ways of representing a graph bringing out the advantages and disadvantages of each representation. (6)

OR

- 16 a) Discuss the inorder, preorder and post order tree traversal recursive algorithms/pseudocodes with suitable examples. (9)

- b) Construct a binary tree from the Pre-order and In-order sequence given below (5)

In-order: DBHEAIFJCG Pre-order: ABDEHCFIJG

Module IV

- 17 a) Explain chained hashing? Discuss its pros and cons. Construct the hash table to insert the keys: 5,28,19,15,20,33,12,17,10 in a chained hash table of 9 memory locations. Use $h(k) = k \bmod 9$. (5)
- b) Explain different collision resolution techniques in hashing. (9)

OR

- 18 a) Consider the list of numbers in sorted order: 10, 20, 30, 40, 50, 60, 70, 80, 90. Write an algorithm to search an element 80 in the given list using binary search. Show all the steps. (7)
- b) Explain the algorithm for selection sort with an example. (7)

Module V

- 19 a) Describe greedy approach with suitable example. (7)
- b) Explain divide and conquer approach in detail with example. (7)

OR

- 20 a) Explain dynamic programming in detail with example. (7)
- b) Describe NP-complete problems with necessary examples. (7)
