Register Number: .....

MCA DEGREE EXAMINATIONS: NOV/DEC 2024

(Regulation 2020)

First Semester

MASTERS IN COMPUTER APPLICATIONS

P20CAT1001 Data Structures and Algorithms

COURSE OUTCOMES

CO1: Analyze the performance of algorithms.

CO2: Apply the knowledge of basic data structures and their implementations.

CO3: Develop skills in applying linear and nonlinear data structures.

CO4: Apply different algorithmic design strategies.

CO5: Understand the concepts of P and NP classes

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 2 = 20 Marks)

1.	Define algorithm efficiency and explain its significance in algorithm analysis.	CO1	[K_1]
2.	List two common asymptotic notations and provide a simple example of each.	CO1	[K_1]
3.	What are the characteristics of a doubly linked list?	CO2	[K_1]
4.	Explain the purpose of the stack data structure. Mention one application of a stack.	CO2	[K_2]
5.	What is a Binary Search Tree (BST), and what is its main advantage?	CO2	[K_1]
6.	List two real-world applications of graph data structures.	CO3	[K_2]
7.	Define the difference between BFS and DFS in graph traversal.	CO3	[K_3]
8.	Define the divide-and-conquer strategy and provide an example.	CO4	[K_2]
9.	What is the knapsack problem in algorithm design?	CO4	[K_1]
10.	Differentiate between NP and NP-complete problems.	CO5	[K_3]

PART C (6 x 5 = 30 Marks)

11.	Analyze the time complexity of an algorithm with nested loops using asymptotic notation.	CO1	[K_4]
12.	Explain the insertion and deletion operations in an array, illustrating each step with	CO2	[K_3]

examples.

13. Compare singly linked lists and doubly linked lists, focusing on performance and memory usage. Provide examples for each. CO2 [K_3]

14. Illustrate Depth-First Search (DFS) and Breadth-First Search (BFS) with a sample graph. Discuss when each traversal is preferred. CO3 [K_3]

15. Demonstrate the steps of Dijkstra's algorithm with a sample graph. Show how the shortest path is determined. CO3 [K_3]

16. Explain the quick sort algorithm and analyze its time complexity. Describe the divide-and-conquer steps involved. CO4 [K_2]

Answer any FIVE Questions

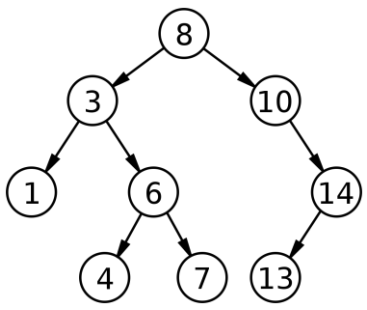
PART C (5 x 10 = 50 Marks)

17. Explain the importance of asymptotic notations such as O(n) and Θ(n) in algorithm analysis. Compare the time complexity of two algorithms using these notations, with examples. 10 CO1 [K_1]

18. Describe the operations of Queue – Enqueue, Dequeue, and Display with suitable examples. 10 CO2 [K_3]

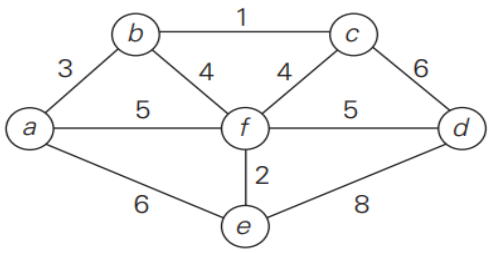
19. Write the suitable routines for implementing a Linked Stack. 10 CO3 [K_3]

20. Write a C program to add a node from the Binary Search Tree. Show how node 2 is added into the following Binary Search Tree: 10 CO3 [K_4]



21. Sort 8, 1, 4, 9, 0, 3, 5, 2, 7, 6 in ascending order using Quick Sort. 10 CO4 [K_3]

22. Find the minimum spanning tree of the following graph using Prim's algorithm: 10 CO4 [K_3]



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