KUMARAGURU
college of technology
character is life

Register Number:……….……

MCA DEGREE EXAMINATIONS: NOV/DEC 2023

(Regulation 2020)

First Semester

MASTER OF 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.	What are the characteristics of an algorithm?	CO1	[K_2]
2.	Differentiate between best-case and worst-case efficiencies.	CO1	[K_2]
3.	What are the limitations of Array implementation?	CO2	[K_2]
4.	Show diagrammatically how a node is inserted as the first node in a doubly linked list.	CO2	[K_2]
5.	What is meant by a strongly connected graph?	CO3	[K_1]
6.	Show the adjacency list representation of the following graph:	CO3	[K_2]
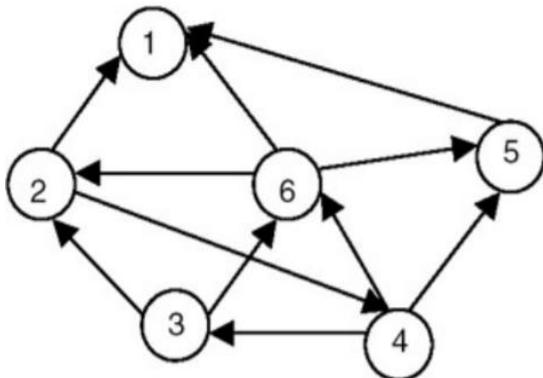
|			
7.	Define a skewed binary tree.	CO3	[K_1]
8.	What is meant by Divide-and-Conquer algorithm technique? Give any two examples.	CO4	[K_2]
9.	What is Hamiltonian Cycle? How does it differ from Hamiltonian Path?	CO4	[K_2]

10. What are the types of complexity classes? CO5 [K1]
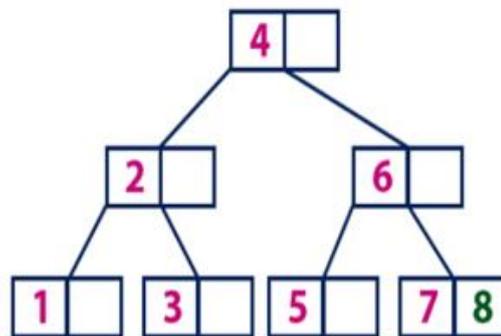
PART C (6 x 5 = 30 Marks)

11. Compare and contrast the asymptotic notations. CO1 [K2]

12. Write an algorithm to insert a node onto a linked stack. CO2 [K3]

13. Write a C program for depth first traversal and show the result of traversing the given tree using Depth-First Search method: CO3 [K3]
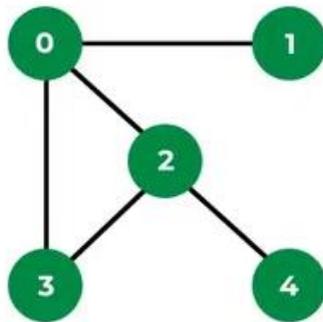
14. Show the resulting tree after inserting node 9 to the following B-Tree of Order 3: CO3 [K2]

15. Write C program for binary search algorithm and explain the time complexity of the algorithm. CO4 [K3]

16. Explain about the P, NP, NP-hard and NP-complete problems. CO5 [K1]

**Answer any FIVE Questions**
PART C (5 x 10 = 50 Marks)

17. Explain the mathematical analysis of recursive functions with a suitable example. CO1 [K₃]

18. Write a C program to implement a Queue with the following operations: CO2 [K₃]
    a. Enqueue
    b. Dequeue

    Demonstrate the enqueue and dequeue operations with a suitable example.

19. Show how the minimum spanning tree is obtained using Prim's and Kruskal's algorithms for the following graph: CO3 [K₄]
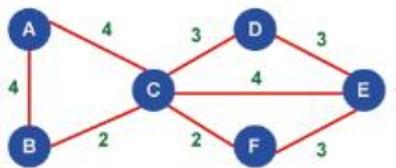
20. Write a C program to remove a node from the Binary Search Tree. Show how node 6 is deleted from the following BST: CO3 [K₄]
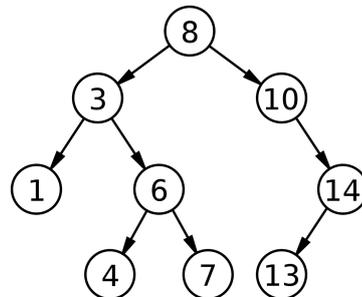
21. Given the elements 12, 3, 9, 7, 23, 2, 10, 8, 15, 1. Show how the elements are arranged in ascending order using Quick Sort algorithm. CO4 [K₄]

22. Explain about the backtracking algorithm design technique and explain the 4-queens problem with its state space diagram. CO4 [K₃]

****