



MCA DEGREE EXAMINATIONS: DEC 2022

(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: -

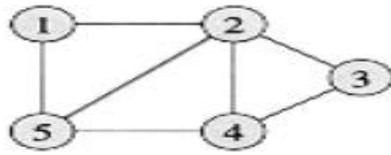
PART A (10 x 2 = 20 Marks)

1. What are the factors to be considered for measuring the efficiency of an algorithm? CO1 [K₁]
2. Define Big-Oh Notation. CO1 [K₂]
3. State the advantages of linked list over array. CO2 [K₃]
4. List the applications of stack. CO2 [K₂]
5. What is transitive closure? Given an example. CO3 [K₂]
6. What is a minimum spanning tree? CO3 [K₂]
7. Define B-tree. CO3 [K₂]
8. Sort the following numbers using Merge sort. CO4 [K₄]
60 10 50 30 40
9. What is knapsack problem? CO4 [K₂]
10. What is meant by NP Hard? CO5 [K₂]

PART B (6 x 5 = 30 Marks)

11. Solve the recurrence relation $M(n) = M(n-1) + 1$, $M(0) = 0$. CO1 [K₄]
12. Write a C program to implement the basic operations of a queue using array. CO2 [K₃]

13. Give the adjacency matrix and adjacency list of the following graph. CO3 [K₃]



14. Write Floyd's algorithm. CO3 [K₂]

15. Arrange the following numbers in ascending order using Quick Sort and give a detailed explanation of the steps performed. CO4 [K₃]

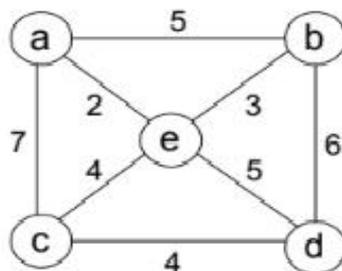
5, 3, 1, 9, 8, 2, 4, 7

16. Write a note on P and NP problems. CO5 [K₂]

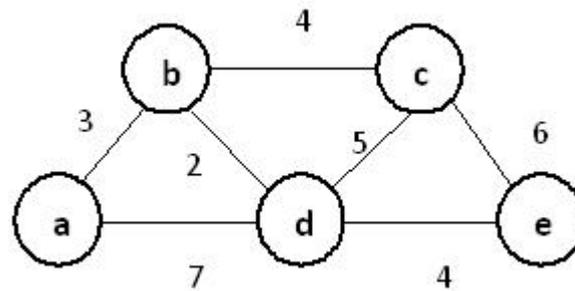
Answer any FIVE Questions

PART C (5 x 10 = 50 Marks)

- 17.i) Explain the general plan for analyzing efficiency of non-recursive algorithms. 4 CO1 [K₂]
 ii) Write a C program to insert an element in the specified position of an existing array. 6 CO2 [K₄]
18. Write a C program to implement the following operations on a linked list: 10 CO2 [K₃]
 i) Insert a node at the beginning.
 ii) Delete the last node
- 19.i) Apply Prim's algorithm on the following graph and find the minimum spanning tree: 5 CO3 [K₃]



- ii) Apply Dijkstra's algorithm for the following graph to find the shortest path from node A. 5 CO3 [K₃]



20. Draw the state space tree for 4 Queens problem and write the solution. 10 CO4 [K₂]
- 21.i) Construct a B-tree of order 3 with the following data: 6 CO3 [K₃]
 . 50, 60, 65, 20, 58, 70, 62, 25 ,75
- ii) Write the algorithm for sequential search and give its time complexity. 4 CO1 [K₂]
22. Find the optimal solution for the assignment problem given below using Branch and bound method: 10 CO4 [K₃]

	Job 1	Job 2	Job 3	Job 4
Person 1	9	2	7	8
Person 2	6	4	3	7
Person 3	5	8	1	8
Person 4	7	6	9	4