

2022

1st Semester Examination

MCA

Paper : MCA 103

(Data Structure and Algorithm)

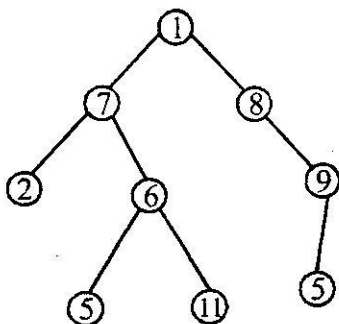
Full Marks : 70

Time : Three Hours

*The figures in the margin indicate full marks.  
Candidates are required to give their answers  
in their own words as far as practicable.*

**Group - A**Answer any *five* questions :  $2 \times 5 = 10$ 

1. (i) Define complete binary tree with an example.
- (ii) What are the important features of an algorithm?
- (iii) Show the level order traversal of the following tree



P.T.O.

- (iv) What do you mean by asymptotic analysis of an algorithm?
- (v) How is a problem solved using branch and bound technique?
- (vi) What is the necessity of approximation algorithm?
- (vii) What do you mean by peep operation in a stack?
- (viii) What are the advantages of linked list over array?

### Group - B

Answer any *four* questions : 15×4=60

2. Convert the following infix expression into postfix expression. Show each step in detail.

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

Write down the algorithm of quicksort. Explain why worst case time complexity of quicksort is more than the average case. 5+8+2

3. Explain operations on doubly linked list in detail with function for add and delete from doubly linked list. Why a tail recursive function is preferred to its non-tail recursive equivalent? What is threaded binary tree? Explain how a binary tree is transform into a threaded binary tree with an example. 7+3+2+3
4. Write an algorithm to check wheather a given list is palindrome or not using stack. Explain dynamic programming approach using a suitable example. 8+7

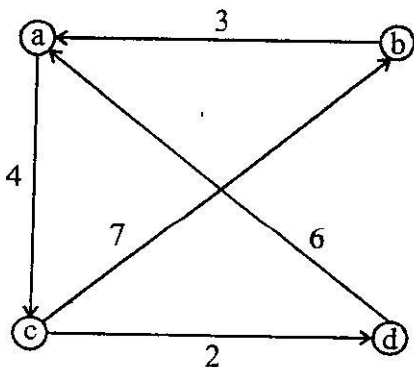
5. Implement radix sort on the following numbers :

23, 55, 29, 41, 36, 90 12

7+8

Briefly explain how Kruskal's algorithm is used to find out the minimum spanning tree of a graph using a suitable example.

6. Derive the all-pair shortest path from the following graph by Floyd-Warshall algorithm using dynamic programming approach.



Write short notes on : polynomial addition using array.

8+7

7. Derive the longest common subsequence from the string "BCDABC" and "CBADCA" using dynamic programming approach. What do you mean by sparse matrix? Why do we need different representation for sparse matrix.

10+3+2

P.T.O.

8. Explain greedy approach with a suitable example. What is the difference between performance analysis and performance measurement? How can we achieve performance analysis? 9+3+3
9. What do you mean by tractable problems? Define class P and class NP problems. What do you mean by reduction? When a problem is called a NP-complete problem? Define row-major and column-major representation of a matrix. 2+5+2+3+3
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2022

1st Semester Examination

MCA

Paper : MCA 198

(Data Structure and Algorithm Lab)

(Practical)

Full Marks : 100

Time : Three Hours

*The figures in the margin indicate full marks.  
Candidates are required to give their answers  
in their own words as far as practicable.*

**Group - A****(Data Structure)**Answer any *one* question :  $1 \times 35 = 35$ 

1. Consider two single dimensional Arrays of size 20 and 30 respectively. Write a program in C to find out the elements which are common in both arrays.
2. Write a program in C to find out whether a matrix is symmetric or not.
3. Write a C program to implement STACK using array.
4. Write a C program to implement STACK using linked list.
5. Write a C program to implement QUEUE using array.

P.T.O.

6. Write a C program to implement QUEUE using linked list.

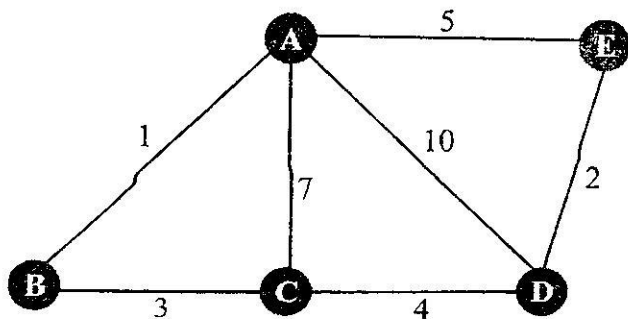
### Group - B

#### (Algorithm)

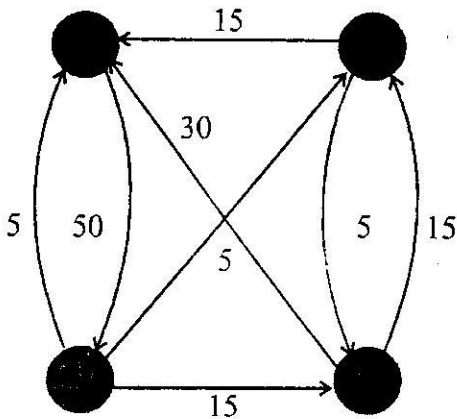
Answer any *one* question on lottery basis.  $1 \times 35 = 35$

*Write source code and input-output for each of the program.*

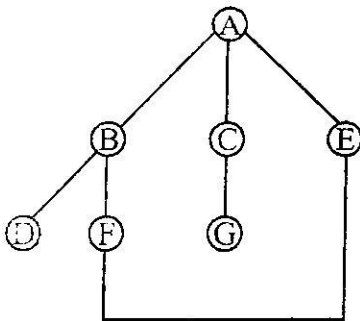
1. Write a program in C to implement the merge sort algorithm. The input will be given by the examiner.
2. Write a C program to sort the list of numbers using heap sort algorithm. The input will be given by the examiner.
3. Implement the matrix-chain multiplication problem in C. For example, there are 4 matrices of dimensions  $40 \times 20$ ,  $20 \times 30$ ,  $30 \times 10$ ,  $10 \times 30$ . Find the minimum number of scalar product.
4. Write a program for finding the minimum cost spanning tree using the Kruskal's algorithm.



5. Implement the all-pair shortest path problem using the Floyd-Warshall algorithm.



6. Write a program for Depth First Search Algorithm in C, starting from the node A.



( 4 )

7. Write a program in C to implement the quick sort algorithm. The input will be given by the examiner.
8. Solve the Eight-Queen problem in C.

	1	2	3	4	5	6	7	8
1				q <sub>1</sub>				
2						q <sub>2</sub>		
3								q <sub>3</sub>
4		q <sub>4</sub>						
5							q <sub>5</sub>	
6	q <sub>6</sub>							
7			q <sub>7</sub>					
8					q <sub>8</sub>			

Viva-voce — 20 marks

LNB — 10 marks

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