

**Section–C** **2×16=32**

**(Long Answer Type Questions)**

*Note* :- Answer any *two* questions. You have to delimit your each answer maximum up to **500** words. Each question carries 16 marks.

10. Describe the following with a suitable example :
- (a) Divide and conquer strategy.
  - (b) Greedy methods.
11. Describe the concept of recursion and its role in problem-solving. Provide an example of a recursive function and explain the steps involved in the recursive process.
12. Describe the Travelling Salesman Problem in detail and discuss two approaches to solve it; the Brute Force approach and the Greedy approach.
13. Consider a weighted undirected graph with the following adjacency matrix :

	A	B	C	D	E
A	[0,	2,	0,	6,	0]
B	[2,	0,	3,	8,	5]
C	[0,	3,	0,	0,	7]
D	[6,	8,	0,	0,	9]
E	[0,	5,	7,	9,	0]

Apply Prim's algorithm to find the minimum spanning tree (MST) starting from vertex A.

**MSCCS-07/MSCCS-201/  
MSCCSC-201/MCA-201**

**June – Examination 2023**

**MSCCS (Final)/MCA (IInd Year)  
Examination**

**Data Structure and Algorithm**

**Paper : MSCCS-07/MSCCS-201/MSCCSC-  
201/MCA-201**

*Time : 3 Hours ]*

*[ Maximum Marks : 80*

*Note* :- The question paper is divided into three Sections A, B and C. Write answers as per the given instructions.

**Section–A** **8×2=16**

**(Very Short Answer Type Questions)**

*Note* :- Answer all questions. As per the nature of the question delimit your answer in one word, one sentence or maximum up to **30** words. Each question carries 2 marks.

1. (i) Differentiate between primitive data types and composite data types.

- (ii) Differentiate between a singly linked list and a doubly linked list.
- (iii) Write the condition when stack is empty.
- (iv) Define the term 'algorithm' in the context of computer science.
- (v) Define the term 'planarity testing' in graph theory.
- (vi) What is the significance of the Big O notation in algorithm analysis ?
- (vii) What do you mean by Spanning tree ? Give an example.
- (viii) If the time complexity of an algorithm is  $O(n^2)$ , how will the number of operations grow if the input size doubles ? Give an example.

**Section-B** **4×8=32**

**(Short Answer Type Questions)**

**Note** :- Answer any *four* questions. Each answer should not exceed **200** words. Each question carries 8 marks.

2. Consider an array of integers [5, 8, 2, 1, 9, 3]. Sort the array in ascending order using the bubble sort algorithm. Show the step-by-step process. Consider an array of integers [5, 8, 2, 1, 9, 3]. Sort the array in ascending order using the bubble sort algorithm. Show the step-by-step process.

- 3. What is Insertion Sort ? Write its algorithm. Compare its complexity with bubble sort.
- 4. Consider a singly linked list that represents a sequence of integers. Write an algorithm to find the sum of all the even integers in the linked list. Also, give the time complexity of the different cases considered.
- 5. Write short note on Knapsack problem.
- 6. Implement a stack data structure using an array. Perform the following operations :
  - (a) Push the elements 4, 7 and 2 onto the stack.
  - (b) Pop an element from the stack.
  - (c) Push the element 9 onto the stack.
  - (d) Pop all elements from the stack.
- 7. Explain and implement a binary search algorithm to search for a target element in a sorted array and return its index. If the element is not found, return -1.
- 8. Given a string, check if it is a palindrome (reads the same forwards and backwards) using a stack data structure.
- 9. Given a binary tree, write a function to find the maximum depth (height) of the tree.