Roll No. : .....

COMS2610

B.Sc., Semester Second

(NEP), Examination, 2024-25

COMPUTER SCIENCE

Paper - Major

[Data Structures and Algorithms]

[Time : 3 Hours] **[Maximum Marks : 75]**

Note : This Question paper contains two sections. Section 'A' contains 08 short answer type questions. Attempt any 05 questions from this section. Each question carries 6 marks. Section 'B' contains 05 long answer type questions. Attempt any 03 questions from this section. Each question carries 15 marks.

SECTION - A
(Short Answer Type Questions)

Note: Attempt any 05 questions out of 08 given below. **(5×6=30)**

1. Differentiate between datatype and data object. Discuss different categories of data structures with suitable examples.

2. What is multidimensional array? Write pseudocode or program code in C/C++ to multiply two matrices.

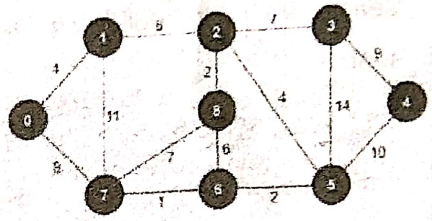
3. What is a linked list? Write pseudocodes or program codes in C/C++ to implement insertion and deletion to and from doubly linked list.

4. Explaining pseudocodes of PUSH() and POP( ), discuss various features of STACK. How do we convert an infix expression into its equivalent polish and reverse polish notations? Explain with examples.

5. What is the need of recursion? Discuss any two computational problems that can be solved with recursion. Also provide pseudocodes or program codes for the same.

6. What is Binary Search Tree (BST)? Explain the process of deletion of a node from BST with corresponding pseudocode and example.

7. Find minimum spanning tree of the following graph with Prim's algorithm. Show each step with neat diagram.



8. Write short notes on any two of the following:
   (i) Circular queue
   (ii) Algorithm complexity and time-space trade-off
   (iii) Selection sort
   (iv) Tree and binary tree

SECTION - B
(Long Answer Type Questions)

Note: Attempt any 03 questions from the following questions of 15 marks each. **(3×15=45)**

9. What do you mean by searching? Giving pseudocodes or algorithms, mechanisms of linear and binary search. Perform the following operations:

(i) Search 78 in the following list with linear search:

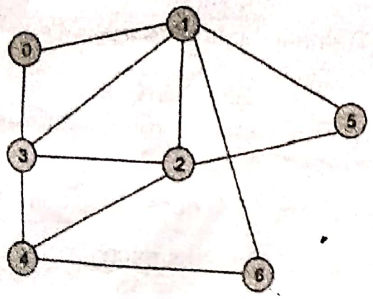
9,100,123,56,9,15,89,123,11,8,56,112

(ii) Search 99 in the following list with binary search:

6,17,19,27,35,49,52,56,67,85,99,100

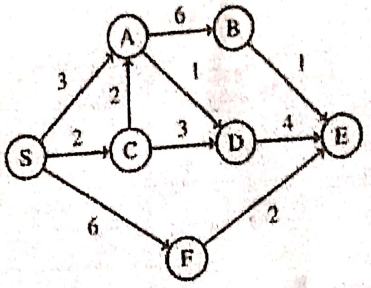
Write all steps clearly.

10. Define the term GRAPH with example. Giving pseudocodes, explain the mechanisms of BFS and DFS. Apply both the algorithms in the following graph. Show each step with neat diagram.



11. What is MERGE SORT? Discuss the complete idea behind merge sort. Provide pseudocode or program code in C/C++ to implement merge sort.

12. Discuss Dijkstra's algorithm for shortest path problem. Apply the same in the following graph:



13. Write short notes on any two of the following:

(a) Quick sort

(b) Arrays and address calculations

(c) Traversing a binary tree

(d) Insertion sort