

**COURSE CODE: MCS-208**  
**MASTER OF COMPUTER APPLICATIONS**  
**(MCAOL)**  
**DATA STRUCTURE AND ALGORITHMS**

**Total Marks-100**

**Time Duration-180 Minutes**

Note : There are three Sections in this paper. Attempt all the Sections. All algorithms should be written nearer to C language.

Section-I (Short Answer Type Questions) (5×4=20)

Note : Attempt any five questions. Each question carries 4 marks.

1. Give simplified big-O notation for the following growth functions:
  - a)  $30n^2$
  - b)  $10n^3 + 6n^2$
  - c)  $5n \log n + 30n$
  - d)  $\log n + 30n$
2. Give an example of an application for which time complexity is more important than space complexity. Justify your answer.
3. What is a triangular matrix? What is a tridiagonal matrix? Give examples.
4. Explain the process of implementation of singly linked lists using array(s).
5. Discuss the underflow and overflow problem in stacks with a suitable example.
6. Compare the array and linked list representations of a queue.
7. If a tree has 45 edges, how many vertices does it have? Justify your answer.

Section-II (Medium Answer Type Questions) (5×10=50)

Note : Attempt any five questions. Each question carries 10 marks.

8. Write an algorithm for the multiplication of two matrices.
9. Sort the following list of integers in descending order using quick sort:

3, 12, 1, 90, 25, 99, 100

Write all the steps involved.

10. Write an algorithm to find the number of vowels in a given text file. Make necessary assumptions.

11. Define AVL tree. Explain various AVL tree rotations.

12. Write an algorithm to find strongly connected components of a graph. Make necessary assumptions.

13. Write an algorithm for performing binary search.

14. What is Index Mapping? What are the challenges with Index mapping?

### Section-III (Long Answer Type Questions) ( $2 \times 15 = 30$ )

Note : Attempt any two questions. Each question carries 15 marks.

15. What is a Queue? List and explain the operations that can be performed on a queue.

16. What is Time Complexity? How does it differ from storage complexity? Give an example for each of time complexity and storage complexity.

17. Write Kruskal's algorithm.