

U.G. 4th Semester Examination - 2025

COMPUTER SCIENCE

[MAJOR]

Course Code : CS-MJ-T-4

(Data Structure)

[NEP-2020]

Full Marks : 60

Time : $2\frac{1}{2}$ Hours

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP-A

1. Answer any **ten** questions: 2×10=20
 - a) Define abstract data type (ADT).
 - b) What are the differences between linear and non-linear data structures?
 - c) Define linked list with example.
 - d) Differentiate between singly and doubly linked lists.
 - e) Find out the number of comparisons in bubble sort algorithm.
 - f) Explain FIFO with example.
 - g) You have an unsorted array of size 10. Which sorting algorithm will you prefer to use in this scenario? Justify your answer.

[Turn over]

- h) Define a binary tree.
- i) What are the ways to store a graph in memory?
- j) When can you use an array to store a tree? Justify your answer.
- k) What intermediate data structures are used to implement a stack in C?
- l) Name the pointers used in a queue.
- m) Describe collision in hashing.
- n) What is sequential file access?
- o) Consider that you have created a music playlist. You can play music, go to the next song, or go back to the previous song. You can also add, remove, or rearrange songs. Explain a data structure that can do that.

GROUP-B

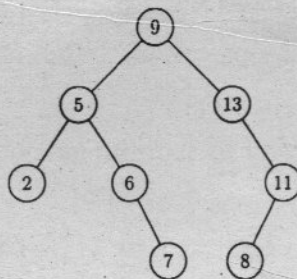
2. Answer any **four** questions: $5 \times 4 = 20$
- a) i) What do you understand by contiguous memory allocation?
 - ii) Consider you have an integer array *arr* of order 5×4 . The starting address of the array is 1004. What is the address of *arr*[3][2]?
 $2+3$
 - b) Consider the postfix expression $12\ 13\ *\ 23\ 9\ +\ -$. Evaluate the expression using a stack. 5
 - c) What do you understand by a queue? What do you understand by overflow and underflow conditions of a queue? $2+3$

- d) Compare and contrast arrays and linked lists with proper examples. 2+3
- e) What is a hashed file? How does hashing help in faster data access? List two common collision resolution techniques in hashed files. 2+2+1
- f) Write an algorithm to implement selection sort on a given unsorted array. 5

GROUP-C

3. Answer any **two** questions: 10×2=20

- a) i) What is tail recursion? With a simple example, explain the tail recursion.
- ii) Can you perform binary search on an unsorted array? Justify.
- iii) Write a recursive algorithm to implement Euclid's algorithm to find the GCD of two natural numbers. (1+3)+2+4
- b) i) Compute the inorder and postorder traversal of the following tree.



- ii) What do you understand by binary search tree?

- iii) Explain the drawback of a binary search tree. What data structures are used to solve this disadvantage? $(2+2)+2+(2+2)$
- c) i) Explain different paradigms of sorting.
- ii) Which common sorting algorithms are stable, and why does it matter?
- iii) Write the partition algorithm of quicksort on a given array named Arr. $4+3+3$
- d) i) How is direct access different from sequential access? Describe a real-life application where direct access is more suitable than sequential access.
- ii) Explain the structure of a B+ tree with a simple example.
- iii) How does a B+ tree differ from a binary search tree in file access? $(2+2)+4+2$