K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

Nov – Dec 2024
(B. Tech) Program: Artificial Intelligence and Data Science Scheme I/II/IIB/III:__III__
Carry On Regular/~~Supplementary~~ Examination: SY Semester: III
Course Code: AIC302 and Course Name: Data Structure and Algorithms
Date of Exam: 25/06/25 Duration: 2.5 Hours Max. Marks: 60

Instructions:
(1)All questions are compulsory.
(2)Draw neat diagrams wherever applicable.
(3)Assume suitable data, if necessary.

Q. No.	Question	Max. Marks	CO	BT level
Q 1	Solve any **two** questions out of three: (05 marks each)	10		
a)	Explain static and dynamic data structure in detail with the help of suitable examples.		CO1	U
b)	Describe the process of insertion (enqueue) and deletion (dequeue) operations in a circular queue. How are the front and rear pointers managed?		CO2	U
c)	Explain the Breadth-First Search (BFS) algorithm. How does it traverse a graph differently compared to Depth-First Search (DFS)?		CO3	U
Q 2	Solve any **two** questions out of three: (05 marks each)	10		
a)	Draw B tree of order 3 created by inserting the flowing data arriving in sequence. 54,24,6,7,10,9,23,4,5		CO4	Ap
b)	Write an algorithm to perform an Interpolation search. Explain with a suitable example.		CO5	U
c)	Choose an appropriate data structure to manage customers waiting in line at a bank. Describe why this data structure is suitable and how it would work to help customers get served in the order they arrive."		CO6	An
Q.3	Solve any **two** questions out of three. (10 marks each)	20		
a)	Write an algorithm to evaluate postfix expressions using stack. Apply this algorithm to compute the result of a given postfix expression."23*54*+9-"		CO2	Ap
b)	Write the algorithm to delete a node at the beginning, end, and at a specified position in a singly linked list. Discuss the time complexity of each operation.		CO2	U
c)	Explain topological sorting in detail with suitable examples.		CO3	U
Q.4	Solve any **two** questions out of three. (10 marks each)	20		

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a)	Construct binary search tree for following elements 24,47,88,14,12,3,5,8,45,99,57,77,10,15,42 perform deletion of 57 and 24.	CO4	Ap
b)	Given array = {33,31,40,8,12,17,25,42}. Perform following: 1. Write an algorithm to sort the array in ascending order using Shell sort. 2. Simulate the Shell sort on a given array. Clearly illustrate each step.	CO5	Ap
c)	A file contains the following characters with the frequencies as shown. Draw the Huffman tree and determine: 1. Huffman code for each character 2. Average code length.	CO4	Ap

Character	Frequencies
A	1
B	1
C	2
D	3
E	5
F	8
G	13
H	21

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