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

Nov – Dec 2024
(B. Tech) Program: Artificial Intelligence and Data Science Scheme I/II/IIB/III: III
Regular/Supplementary Examination: SY Semester: III
Course Code: AIC302 and Course Name: Data Structure and Algorithms
Date of Exam: 18/12/2024 Duration: 02.5 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)	Assume that we have an initially empty queue, Q, of integers. Fill in the following table (we have completed the first two rows), showing the output returned by each method call and the internal state of the queue after that point in time.		CO2	U
b)	Use a stack to evaluate the postfix expression below. Please show the state of the stack at the exact point in time during the algorithm that the marked A,B,C positions. Write the final answer. A B C 2 6 8 * 2 5 * 3 1 - + / 9 3 / + *		CO2	Ap

Operation	**Output**	***Q*** **(front, ..., rear)**
Q.enqueue(10)	-	(10)
Q.enqueue(4)	-	(10, 4)
Q.size()		
Q.peek()		
Q.enqueue(6)		
Q.dequeue()		
Q.enqueue(3)		
Q.dequeue()		
Q.peek()		
Q.dequeue()		
Q.enqueue(7)		
Q.peek()		

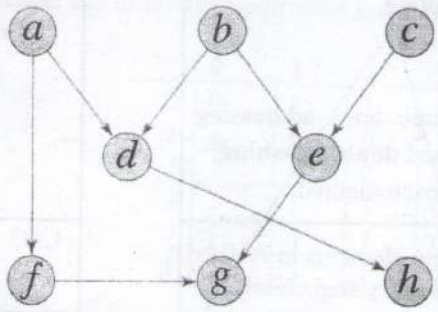
K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

Nov – Dec 2024
(B. Tech) Program: Artificial Intelligence and Data Science Scheme I/II/IIB/III:__III__
Regular/Supplementary Examination: SY Semester: III
Course Code: AIC302 and Course Name: Data Structure and Algorithms
Date of Exam: 19 / 12/2024 Duration: 02.5 Hours Max. Marks: 60

c)	Given the postorder and inorder traversal of a binary tree, construct the original tree. Postorder: D E F B G L J K H C A Inorder: D B F E A G C L J H K		CO3	Ap
Q 2	Solve any **two** questions out of three: (05 marks each)	10		
a)	How do we measure the efficiency of an algorithm? Explain asymptotic notations.		CO1	U
b)	Explain the bubble sort algorithm with an example		CO5	U
c)	Explain the binary search algorithm with an example.		CO5	U
Q.3	Solve any **two** questions out of three. (10 marks each)	20		
a)	A university's student database needs to manage student IDs for quick access and retrieval. The database is stored in a hash table of size 10, where each student ID is hashed to determine its index in the table. However, due to limited space, collisions are inevitable, and different open addressing methods are applied to handle these collisions. **Given Data**: {63,22,94,77,53,87,23,55,10,44} 1. **Task**: o Hash these student IDs into the table using three open addressing techniques: **linear probing**, **quadratic probing**, and **double hashing**. o Determine the number of collisions that occur for each method.		CO6	Ap
b)	What is the balance factor in AVL tree. Insert following elements in AVL tree: 44, 17, 32, 78, 50, 88, 48, 62, 54. Show each and every step clearly.		CO3	Ap
c)	Consider the following undirected graph represented as an adjacency list: Graph: A: B, C B: A, D, E C: A, F D: B E: B, F F: C, E 1. Simulate the Breadth-First Search (BFS) traversal starting from node **A**. Show each step, listing the nodes in the order they are visited and the contents of the queue at each stage.		CO4	Ap

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
Regular/Supplementary Examination: SY Semester: III
Course Code: AIC302 and Course Name: Data Structure and Algorithms
Date of Exam: 23/11/2024 Duration: 02.5 Hours Max. Marks: 60

	and the contents of the stack at each stage.			
Q.4	Solve any **two** questions out of three. (10 marks each)	20		
a)	Write a program to create a singly linked list containing the following functions: a) Insert at end b) Display c) Count odd and even elements in the list. d) Delete a desired data		CO4	Ap
b)	Given the array arr = [38, 27, 43, 3, 9, 82, 10], perform the following tasks: 1. Write an algorithm to sort the arrays in ascending order using mege sort. 2. Simulate the merge sort algorithm on this array. Show all the steps of dividing the array and merging the sorted subarrays back together. Clearly illustrate each split and each merge operation, with the resulting subarrays after each merge.		CO5	Ap
c)	Write an algorithm for Topological sort. Carry out topological sort on following graph, showing each step clearly 		CO4	BL3

****