SVKM'S NMIMS

MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT& ENGINEERING

Academic Year: 2023-2024

Program: Master of Computer Applications (MCA)

Year: I   Semester: I

Subject: Data Structures and Algorithms

Time: 3 Hrs. (10 am to 1 pm)
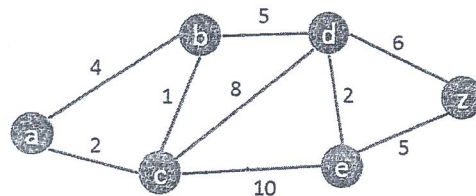
Date: 27 / 11 / 2023.

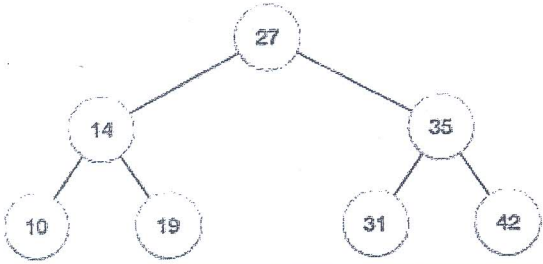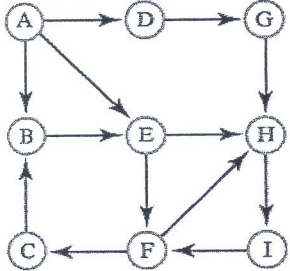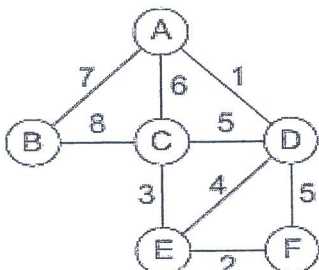No. of Pages: 02

Marks: 100

Final Examination

Instructions: Candidates should read carefully the instructions printed on the question paper and on the cover of the Answer Book, which is provided for their use.

1) Question No. _1_ is compulsory.

2) Out of remaining questions, attempt any _4_ questions.

3) **In all _5_ questions to be attempted.**

4) All questions carry equal marks.

5) **Answer to each new question to be started on a fresh page.**

6) **Figures in brackets on the right hand side indicate full marks.**

7) **Assume Suitable data if necessary.**

Q1		Answer briefly:	
CO-1; BL-L	a.	Discuss different classes of data structures with suitable example.	[05]
CO-1; BL-L	b.	Explain different factors used during the performance analysis of an algorithm? Give example.	[05]
CO-2; BL-M	c.	Describe the scenario where doubly linked list is necessary. Perform insert operation for the doubly linked list.	[05]
CO-4; BL-M	d.	Write algorithm for linear search and discuss its time complexity analysis.	[05]
Q2 CO-2; BL-M	a.	Write an algorithm to read data in static data structure: 12, 34, 23, 56, 45, 67, 25, 10, 15. 30. Perform following operations and discuss the challenges faced while performing Traversal, Insertion and Deletion operations.	[10]
CO-2; BL-L	b.	How do you represent a queue using Linked List? Write suitable algorithms to perform Insert and Delete operation on queue.	[10]
Q3 CO-3; BL-M	a.	What do you mean by Complete Binary Tree? Construct complete binary tree for the given sequence: 18, 34, 23, 56, 56, 67, 25, 18, 23, 30, 16, with the help of algorithm.	[10]
CO-3; BL-H	b.	Consider the following graph and apply the single source shortest path algorithm to find the shortest path from source node "a" to destination node "z". Show the stepwise calculation of the shortest distance from node "a" to every other node of the graph.	[10]

Q4 CO-2; BL-H	a.	Discuss with suitable scenario the need of circular queue with static data structures. Demonstrate all the necessary operations perform on circular queue with the help of suitable algorithms.	[10]
CO-4; BL-L	b.	Explain the Binary Search algorithm with the following example and search 94. Perform best, average, and worst-case complexity analysis on the same. Example: 14, 24, 34, 42, 65, 76, 84, 92, 94, 98, 100	[10]
Q5 CO-4; BL-L	a.	Discuss the application of stack with all the operations and necessary conditions performed with Linked List and suitable algorithms.	[10]
CO-3; BL-H	b.	Identify the cases for the deletion from the following Binary Search Tree. Write suitable algorithms to implement the identified cases for deletion. 	[10]
Q6 CO-3; BL-M	a.	Write and apply the Breadth First Search algorithm to traverse the following graph starting with node A. Demonstrate the use of appropriate data structures during traversal with all the necessary steps. Display the final sequence. 	[10]
CO-4; BL-L	b.	Explain the Selection sort algorithm with a suitable example. Perform best, average, and worst-case complexity analysis on the same.	[10]
Q7 CO-3; BL-M	a.	What is the significance of binary tree in Huffman encoding? Explain with the suitable example.	[10]
CO-3; BL-H	b.	A cable company wants to connect six villages (given in the graphs as nodes) to their network, which currently extends to the market town. Find out the minimum length of cable needed with the help of Kruskal's algorithm. Show all the steps along with the use of data structures. 	[10]