

RV COLLEGE OF ENGINEERING®

(An Autonomous Institution affiliated to VTU, Belagavi)

I Semester Master of Technology (Computer Science and Engineering)**ADVANCED DATA STRUCTURES AND ALGORITHM****Time: 03 Hours****Maximum Marks: 100****Instructions to candidates:**

- Each unit consists of two questions of 16 marks each.
- Answer FIVE full questions selecting one from each unit (1 to 5).
- Question 11 is mandatory and carries 20 marks.

UNIT-1

1	a	Solve the following recurrence using the Master Theorem, also state which case is applicable. $T(n) = 5T(n/3) + n \log n$.	04
	b	Describe each of the basic Abstract Data Types (ADTs) in brief along with its operations.	06
	c	Consider an array of floating-point numbers between 0 and 1: [0.42, 0.32, 0.33, 0.52, 0.37, 0.47, 0.51]. Sort this array using Bucket Sort algorithm.	06
OR			
2	a	Using recursion tree method, solve the recurrence $T(n) = 4T(n/2) + n^2$. Also determine the cost of the entire tree.	06
	b	What is the main difference between a stack and a queue? Given an example of a situation where a stack would be useful.	04
	c	Write an algorithm that uses Radix sort with the LSD technique to sort the provided array [170, 45, 75, 90, 802, 24, 2, 66].	06

UNIT-2

3	a	How can Breadth First Search (BFS) be applied to Social Network Analysis and pathfinding & navigation?	06
	b	Consider the following graph in Fig. 3.b, and find the shortest path using the Bellman Ford algorithm.	
	c	Differentiate between Prim's and Kruskal's algorithms.	06
OR			
4	a	How does Depth First Search (DFS) work, and what are its applications?	04

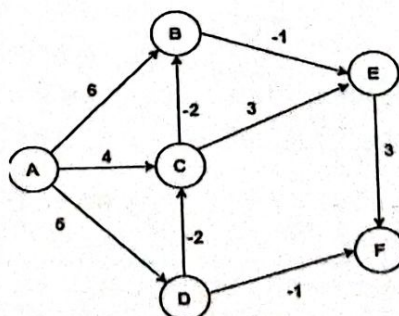
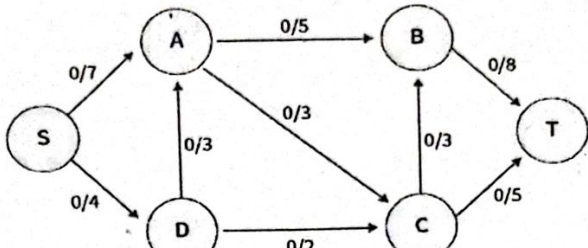
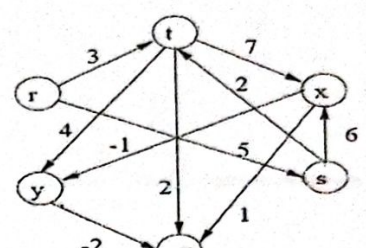
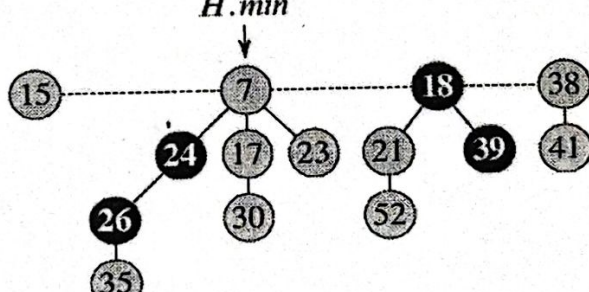


Fig. 3.b

b	<p>Apply Ford Fulkerson algorithm to compute the maximum network flow for the given graph G in Fig. 4.b, with S as source and T as sink nodes.</p>	
	 <p style="text-align: center;">Fig. 4.b</p>	
c	<p>Show the execution of Single source shortest paths in DAG for the given graph in Fig. 4.c, considering s as the source node.</p>	06
	 <p style="text-align: center;">Fig. 4.c</p>	06

UNIT-3

5	a	<p>Demonstrate with algorithm and suitable example, insert and union operation in Fibonacci heap.</p>	08
	b	<p>Discuss <i>MILLER – RABIN</i> randomized primarily test with the help of pseudocode and illustrate the operation of <i>MILLER – RABIN</i> for $n = 561$.</p>	08
		OR	
6	a	<p>With suitable <i>DECREASE KEY</i> pseudocode, explain how to reduce a node with key 35 to 5 in fig 6a.</p>	
		 <p style="text-align: center;">Fig. 6.a</p>	08
	b	<p>Differentiate between Las Vegas algorithm and a Monte Carlo algorithm using suitable examples.</p>	08

UNIT-4

7	a	<p>Suppose, we have a hash table with a size of 10 slots. Insert the following keys into the table: 12, 25, 35, 44, 55, 68, 79, 90, and 102 using double hashing.</p>	10
	b	<p>Insert the following keys into a trie: "cat", "car", "cart", "care", and "cab".</p>	06
		OR	
8	a	<p>With psuedocode/algorithm, discuss in detail the Trie operations with suitable examples.</p>	08

b	Briefly discuss the following: i) Linear Probing, ii) Quadratic Probing, iii) Double Hashing, and iv) Perfect Hashing	08
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UNIT-5

9	a	Discuss String matching with finite automata and construct the string matching automation for the pattern $p = ababaca$ and illustrate its operation on the text string: $T = abababacaba$.	08
	b	Illustrate the Levenshtein distance algorithm to find the Levenshtein distance between the strings "kitten" and "sitting"	08
OR			
10	a	Discuss Knuth Morris Pratt (KMP) string matching algorithm to find the pattern $p = 001002$ in the text $T = 00100100200100201001002$. Also give the complexity of KMP algorithm.	10
	b	Demonstrate the implementation of Levelshtein Edit distance algorithm using an example.	06
LAB COMPONENT			
11	a	Write a C/C++ program to find the shortest path using Bellman Ford algorithm.	10
	b	Write a C/C++ program to implement Maximum flow in the network using Ford Fulkerson algorithm.	10