



P.E.S. College of Engineering, Mandya - 571 401
 (An Autonomous Institution affiliated to VTU, Belagavi)
Fourth Semester, B.E. - Information Science and Engineering
Semester End Examination; August - 2023
Design and Analysis of Algorithms

Time: 3 hrs

Max. Marks: 100

Course Outcomes

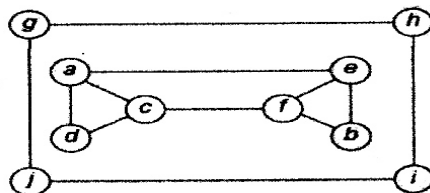
The Students will be able to:

- CO1: Use of asymptotic notations to analyze the performance of algorithms.
- CO2: Analyze the design of algorithm using brute force, decrease and conquer.
- CO3: Analyze the design of algorithm using divide and conquer, transfer and conquer.
- CO4: Analyze the decision of algorithm using space and time tradeoffs, dynamic programming.
- CO5: Analyze the design of algorithm using greedy technique, backtracking, branch and bound techniques

Note: I) PART - A is compulsory. Two marks for each question.

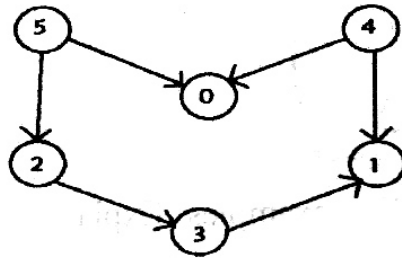
II) PART - B: Answer any Two sub questions (from a, b, c) for a Maximum of 18 marks from each unit.

Q. No.	Questions	Marks	BLs	COs	POs
I : PART - A		10			
1 a.	Write a Euclid's algorithm for computing GCD (m,n).	2	L1	CO1	PO1
b.	List out any two drawbacks of source removal algorithm used for topological sorting with respect to time efficiency.	2	L1	CO2	PO1
c.	Give the recurrence relation $T(n)$ for the binary search algorithm.	2	L1	CO3	PO1
d.	State the purpose of dynamic programming.	2	L1	CO4	PO1
e.	List any two applications of the greedy strategy.	2	L1	CO5	PO1
II : PART - B		90			
UNIT - I		18			
2 a.	Define algorithm and also list its characteristics. Write an algorithm for Sieve of Eratosthenes.	9	L2	CO1	PO1
b.	Explain various asymptotic notation used in analyzing an algorithm. Give examples.	9	L2	CO1	PO1
c.	Design algorithm for determining whether all the elements in the given collection are distinct or not and give the general plan for analyzing that algorithm. Analyze for its complexity.	9	L3	CO1	PO1
UNIT - II		18			
3 a.	With an algorithm and suitable example, explain how the bubble sort algorithm works? Also show that the time complexity of this algorithm is quadratic.	9	L3	CO2	PO1
b.	Write an algorithm for the Breadth-First search (BFS) traversal of a given graph. Apply the same on the graph shown below and also represent the tree edges and cross adjust in the BFS tree.	9	L3	CO2	PO1



Contd...2

- c. Design an algorithm for topological sorting using Depth-First Search (DFS) and apply the same on the graph shown below. Analyze for its complexity.



9 L3 CO2 PO1

UNIT - III

18

- 4 a. Explain the need of divide and conquer technique in brief. Write an algorithm for merge sort. Mention the time complexity of merge sort.
- b. State the purpose of AVL tree. Explain the four types of rotations used to construct the AVL tree. Construct an AVL tree for the list 14, 17, 11, 7, 53, 4, 13, 12 by successive insertions.
- c. Define heap tree. List out the properties of heap tree. Sort the list 2, 9, 7, 6, 5, 8 using heap sort.

9 L2 CO3 PO1

9 L3 CO3 PO1

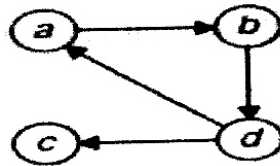
9 L3 CO3 PO1

UNIT - IV

18

- 5 a. Write an algorithm to sort by distribution counting method and apply the same on 13, 11, 12, 13, 12, 12. Obtain it's time complexity.
- b. Explain dynamic programming with Warshall's algorithm. Apply Warshall's algorithm for the digraph given below.

9 L3 CO4 PO1



9 L3 CO4 PO1

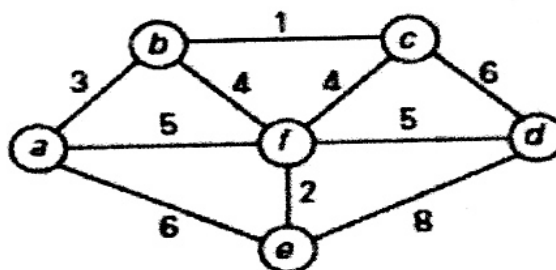
- c. Design an algorithm for knapsack problem using dynamic programming and solve the following instance of the knapsack problem, $n = 4$; weights $(w_1, w_2, w_3, w_4) = (2, 1, 3, 2)$; Profits $(p_1, p_2, p_3, p_4) = (12, 10, 20, 15)$; capacity $W = 5$.

9 L3 CO4 PO2

UNIT - V

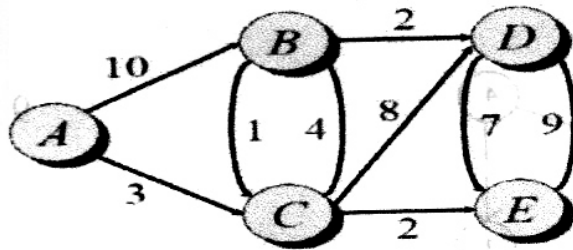
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- 6 a. Explain greedy technique with Kruskal's algorithm. Obtain minimum spanning tree for the graph given below using Kruskal's algorithm.



9 L3 CO5 PO1

- b. Write Dijkstra's single source shortest path algorithm and apply the same on the given graph taking the source as A:



9 L3 CO5 PO1

- c. What is P, NP, NP-complete problem? Give examples. Explain backtracking, with an example.

9 L2 CO5 PO1

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