

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

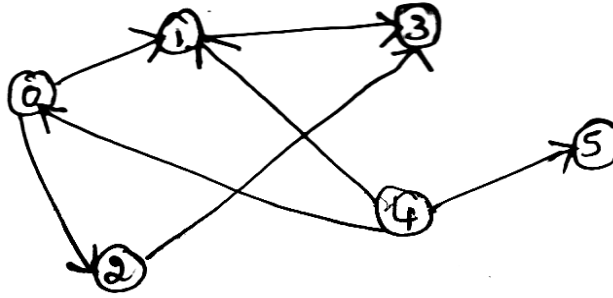
Time: 3 hrs

Max. Marks: 100

**Course Outcomes***The Students will be able to:**CO1: Understand the basic concepts of various algorithmic techniques.**CO2: Analyze the asymptotic performance of algorithms.**CO3: Design solutions for the given problem using algorithmic technique.***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
<b>I : PART - A</b>		<b>10</b>			
1 a.	List the important problem types in algorithm.	2	L1	CO1	PO1,2
b.	Write the recurrence relation for worst case time efficiency of quick sort.	2	L1	CO1,2	PO1,2
c.	Explain dynamic programming.	2	L1	CO3	PO1,2
d.	Write the differences between BFS and DFS.	2	L1	CO1,3	PO1,2,3
e.	Explain Greedy technique in brief.	2	L1	CO1,3	PO1,2,3
<b>II : PART - B</b>		<b>90</b>			
<b>UNIT - I</b>		<b>18</b>			
2 a.	What is an algorithm? Explain the fundamentals of algorithmic problem solving with a neat diagram.	9	L2	CO1,3	PO1,2,3
b.	Design an algorithm to multiply two matrices and obtain its time complexity.	9	L3	CO1,2,3	PO1,2,3
c.	Explain the different asymptotic notations used in analyzing an algorithm with example.	9	L2	CO1,2	PO1,2
<b>UNIT - II</b>		<b>18</b>			
3 a.	Write an algorithm for string matching using Brute force technique. Explain the working for the given example. Main string: analysis and design Pattern string: design Replacement string: XXXXXX	9	L3	CO1,3	PO1,2,3
b.	Write an algorithm to sort the array elements in increasing order using insertion sort and explain the working with an example.	9	L4	CO1,2,3	PO1,2,3

c. Write an algorithm for DFS and apply the same for the given graph.



9 L3 CO1,3 PO1,2,3

**UNIT - III**

**18**

4 a. Write an algorithm for quick sort. Analyze its worst case time complexity.

9 L4 CO1,2,3PO1,2,3

b. Explain Strassen's matrix multiplication and analyze its time complexity.

9 L4 CO1,2,3PO1,2,3

c. Explain max heap with an example and show the steps to sort the array elements 15, 20, 7, 9, 30 using heap sort.

9 L3 CO1,2,3PO1,2,3

**UNIT - IV**

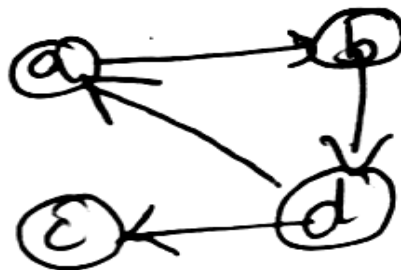
**18**

5 a. Write an algorithm for Knapsack problem using dynamic programming and solve the following instance. Knapsack capacity  $M = 5$ .

Item	Weight	Value
1	2	\$12
2	1	\$10
3	3	\$20
4	2	\$15

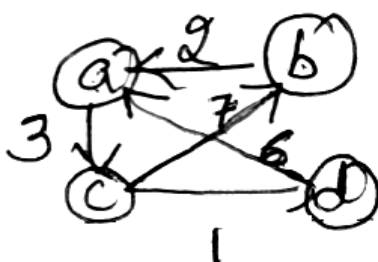
9 L3 CO1,2,3PO1,2,3

b. Write Warshall's algorithm and apply the Warshall's algorithm for the given graph to find out the transitive closure.



9 L4 CO1,2,3PO1,2,3

c. Design Floyd's algorithm to find all-pairs shortest path using dynamic programming and apply the same for the given graph.



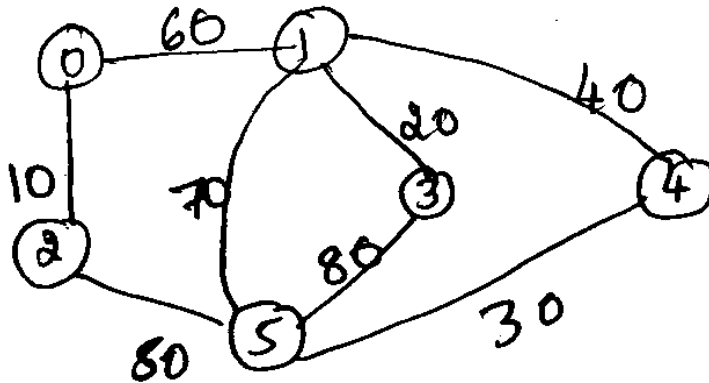
	a	b	c	d
a	0	∞	3	∞
b	2	0	∞	∞
c	∞	7	0	1
d	6	∞	∞	0

9 L3 CO1,2,3PO1,2,3

UNIT - V

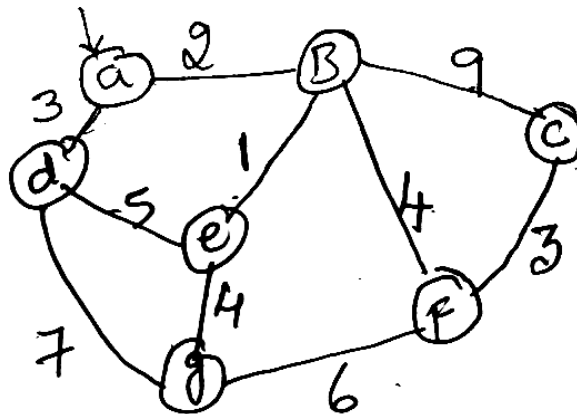
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6 a. Write prim's algorithm to find the minimum spanning tree and apply the same for the given graph and obtain the minimum spanning tree.



9 L3 CO1,2,3PO1,2,3

b. Write Dijkstra's algorithm to find the single source shortest distance between the vertices and apply the same for the given graph.



9 L3 CO1,2,3PO1,2,3

c. Explain Backtracking problem. Solve the following Knapsack problem using branch and bound given the following data:  
Capacity of Knapsack,  $M = 10$ .

item	weight	value	$\frac{\text{value}}{\text{weight}}$
1	4	\$40	10
2	7	\$42	6
3	5	\$25	5
4	3	\$12	4

9 L4 CO1,2,3PO1,2,3

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