Hall Ticket No: | | | | | | | | | | |

Course Code: A8516

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

II B.Tech II Semester Regular Examinations, July - 2024

(Regulations: VCE-R22)

DESIGN AND ANALYSIS OF ALGORITHMS

(Model Paper)

(CSE/CSE(AIML)/ AIML /IT)

Date: XX July 2024 **Time: 3 Hours** **Maximum Marks: 60**

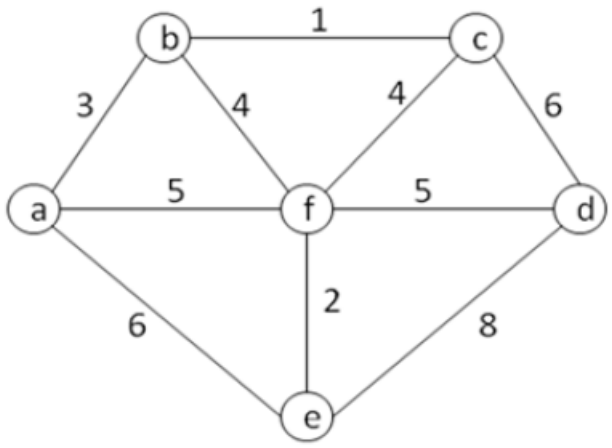
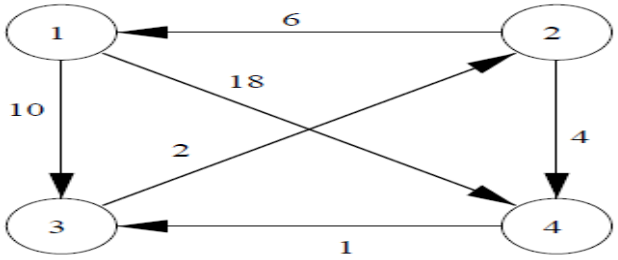
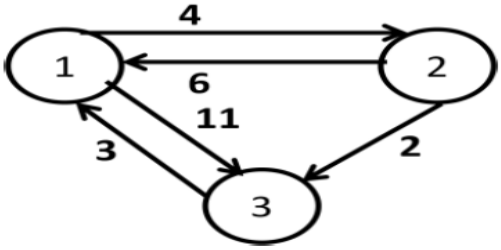
Answer all questions at one place only.

Course Outcomes with Bloom's Levels:

CO#	***CO Statement***	***Bloom's Level (L#)***
CO1	Make use of asymptotic notations, divide and conquer techniques to decompose complex problems into small and simple.	L3
CO2	Choose Greedy method to find out feasible solutions of problems.	L3
CO3	Examine complex engineering problems in finding the optimal solution.	L4
CO4	Construct all possible solutions using backtracking methods.	L3
CO5	Inspect Branch and Bound techniques and NP complete problems significance in algorithms.	L4

Questions:

PART-A (Short Answer Type Questions)					
			CO#	***BL#***	***Marks***
1.	a)	What are the characteristics of an algorithm.	CO1	BL1	***1 M***
	b)	Determine the descending order for the following functions O(n!) , O(n),O(n^3) , O(1), O(nlogn), O(logn)	CO1	BL2	***1 M***
	c)	Describe minimum cost spanning tree	CO2	BL2	***1 M***
	d)	What is the objective of knapsack problem?	CO2	BL1	***1 M***
	e)	Which algorithm is used for all pair shortest path problem?	CO3	BL1	***1 M***
	f)	List the applications of dynamic programming.	CO3	BL1	***1 M***
	g)	Describe N-Queen's problem	CO4	BL2	***1 M***
	h)	State the sum of subsets problem.	CO4	BL1	***1 M***
	i)	What are the applications of branch and bound approach.	CO5	BL1	***1 M***
	j)	Draw the relationship between P, NP, NP-Hard and NP-Complete.	CO5	BL1	***1 M***
PART-B (Descriptive Questions)					
2.	a)	Explain the Quick sort algorithm	CO1	BL2	***5 M***
	b)	Discuss briefly about various asymptotic notations with examples.	CO1	BL3	***5 M***
		(OR)			
	c)	How Strassen's reduced the time complexity compared to traditional matrix multiplication.	CO1	BL3	***5 M***
	d)	Sort the following elements in the ascending order, by applying merge sort algorithm. 12,13,18,15,14,17,16,19,11 .	CO1	BL3	***5 M***
3.	a)	Solve the following knapsack problem where M=40 and N=4 using greedy technique. Weights [W1, W2, W3, W4] = [20, 25, 10, 15] Profits	CO2	BL3	***5 M***

		[P1, P2, P3, P4] = [20, 40, 35, 45]			
	b)	Write the pseudo code for Kruskal's algorithm. Solve the following graph for its minimum spanning tree.  **Fig.1**	CO2	BL3	***5 M***
		(OR)			
	c)	Apply Greedy method to find an optimal solution generated by Job Sequencing when n=7, (P1,P2...P7) = (20,15,10,7,5,3,10) and (D1,D2..D7)=(3,1,1,3,1,3,2).	CO2	BL3	***5 M***
	d)	Using *Dijkstra's* algorithm find single source shortest path for the following weighted graph  	CO2	BL3	***5 M***
4.	a)	State the Objective of all pairs shortest path and provide the solution of all pairs shortest paths for the following.  	CO3	BL4	***5 M***
	b)	Construct OBST for n=3, identifiers (a1, a2, a3)=(do, if, while), probabilities p(1 : 3)=(3, 3, 1) and q(0 : 3)=(2, 3, 1, 1).	CO3	BL4	***5 M***
		(OR)			
	c)	Using Dynamic Programming, find the fully parenthesized matrix product for multiplying the chain of matrices< A1 A2 A3 A4 A5 > whose dimensions are <30X35>, <35X15>, <15X5>, <5X10> and <10X20> respectively.	CO3	BL3	***10 M***

<table>
<tr><td colspan="6"></td></tr>
<tr><td rowspan="5">5.</td><td>a)</td><td>Draw and explain the tree organization of the 4-queen solution space?</td><td>CO4</td><td>BL2</td><td>5 M</td></tr>
<tr><td>b)</td><td>Apply backtracking to solve the following instance of the subset-sum problem: S={3, 5, 6, 7} and d=15</td><td>CO4</td><td>BL3</td><td>5 M</td></tr>
<tr><td colspan="5">(OR)</td></tr>
<tr><td>c)</td><td>Write an algorithm to find Hamiltonian Cycles in given graph.</td><td>CO4</td><td>BL3</td><td>5 M</td></tr>
<tr><td>d)</td><td>Construct knapsack instance for the following data n=3, m=21, P=(25,24,18) and W=(18,15,10) using backtracking?</td><td>CO4</td><td>BL3</td><td>5 M</td></tr>
<tr><td colspan="6"></td></tr>
<tr><td rowspan="4">6.</td><td>a)</td><td>Apply branch and bound algorithm to solve the travelling sales person problem for the graph with a cost adjacency matrix as follows.
$\begin{bmatrix} \infty & 20 & 30 & 10 & 11 \\ 15 & \infty & 16 & 4 & 2 \\ 3 & 5 & \infty & 2 & 4 \\ 19 & 6 & 18 & \infty & 3 \\ 16 & 4 & 7 & 16 & \infty \end{bmatrix}$</td><td>CO5</td><td>BL3</td><td>10 M</td></tr>
<tr><td colspan="5">(OR)</td></tr>
<tr><td>b)</td><td>Solve the following instance of the knapsack problem using the branch and bound technique for W-15.
<table><tr><th>i</th><th>Pi</th><th>wi</th></tr><tr><td>1</td><td>10</td><td>2</td></tr><tr><td>2</td><td>10</td><td>4</td></tr><tr><td>3</td><td>12</td><td>6</td></tr><tr><td>4</td><td>18</td><td>9</td></tr></table></td><td>CO5</td><td>BL3</td><td>5 M</td></tr>
<tr><td>c)</td><td>Identify a Non-deterministic algorithm for searching and sorting?</td><td>CO5</td><td>BL2</td><td>5 M</td></tr>
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