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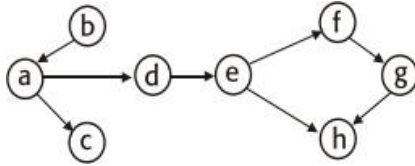
RV COLLEGE OF ENGINEERING
Autonomous Institution affiliated to VTU
IV Semester B.E. Model Question Paper
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
Common to CS, IS, CY, CD and AIML
DESIGN AND ANALYSIS OF ALGORITHMS
(2022 SCHEME)

Time: 03 Hours**Maximum Marks: 100****Instructions to candidates:**

1. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
2. Answer FIVE full questions from Part B. In Part B question number 2 is compulsory. Answer any one full question from 3 and 4, 5 and 6, 7 and 8, and 9 and 10.

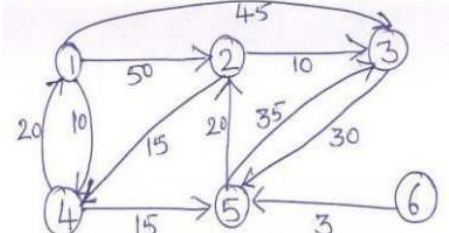
1.1	State the basic operation in the recursive function to find factorial of a number.	01	1
1.2	Denote the best case efficiency of linear search algorithm?	01	1
1.3	What is the worst case efficiency of naïve string matching algorithm?	01	1
1.4	Differentiate between the back and the cross edges.	01	2
1.5	In empirical analysis if efficiency class of the algorithm is $n \log n$, then what will be the graph type ?	01	1
1.6	What is the time complexity of following code? <pre>void fun() { for(i=1, i<=n; i++) for(j=1; j<=n; j=j+i) sum=sum + a[i]* j; }</pre>	01	3
1.7	Compare and contrast DFS and BFS ?	02	2
1.8	Apply master –theorem to find the efficiency of a. $T(n) = 2T(n/2) + n \log n$ b. $T(n) = 16T(n/4) + n$	02	3
1.9	If 'n' coins are divide into three piles each, find the time complexity in identifying the fake coin among those.	02	3
1.10	How is backtracking different from branch and bound technique?	02	2
1.11	Write the decision tree to find the maximum of three numbers.	02	3
1.12	Mention the worst, best and average case efficiency of Quick sort algorithm.	02	1
	Construct the bad shift table and Good suffix table for the following pattern: AT_THAT	02	3

PART-B				
UNIT-I				
2	a	Discuss with a neat flow chart the process of algorithm design and analysis.	06	2

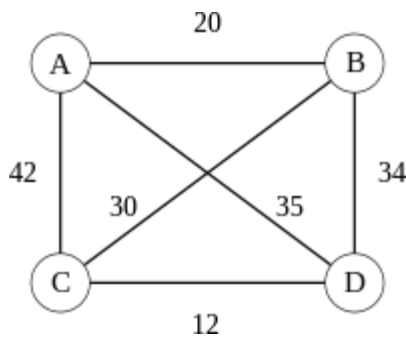
	b	Explain Asymptotic notations for algorithm analysis with help of graphs.	06	2
	c	Write a recursive algorithm to solve the tower of hanoi problem and find the time complexity of the algorithm?	04	3
		UNIT-II		
3	a	Sort the following array elements using Quick sort and write the recursive tree call for the given set of elements. Derive the worst case for the quick sort and calculate the time complexity for the same. 6, 10, 13, 5, 8, 3, 2, 11	06	3
	b	Design a divide and conquer algorithm to count the number of leaf nodes in binary tree. Write the recurrence relation and solve the same to find the time complexity of the algorithm.	06	3
	c	Compute $234 * 2424$ using divide and conquer. Discuss the efficiency of algorithm.	04	3
		OR		
4	a	Define topological ordering. Perform DFS based topological ordering for the graph given below 	06	3
	b	Write an algorithm to perform BFS traversal.	06	2
	c	Apply decrease and conquer to find the median among the following elements: 4 1 10 9 7 12 8 2 15	04	3
		UNIT-III		
5	a	Sort the list in non-decreasing order 1,8,6,5,3,7,4 using Heap sort. Show the heapification at every step.(Construct heap using Bottom-Up method)	06	3
	b	Consider the problem of searching for pattern in a text using Horspool's algorithm. Text: JIMY_HAILED_THE_LEADER_TO_STOP Pattern: LEADER Construct the shift table and apply Horspool's algorithm to locate the pattern in the given text.	04	3
	c	How many character comparisons will be made by Boyer Moore's algorithm in searching for each of the following patterns in a text of 1000 A's? a) AAAAB b) BAAAA c) ABABA	06	3
		OR		
6	a	With Pseudocode, discuss Horspool String matching algorithm and analyze its time complexity	06	3
	b	Apply Presorting method to find the mode for the following set of element. Show the value of runlength, runvalue,mode frequency and mode value in each iteration A B C B B C C E A B C E D	06	3

	c	Show the state of each pass and final array after applying comparison counting sort for the list: 64, 23, 15, 07, 48, 11 to sort the elements in non-decreasing order.	04	3
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UNIT-IV

7	a	<p>Explain Dijkstra's shortest path finding algorithm. Using the same find shortest path from vertex '2' to the remaining vertices.</p> 	06	3																								
	b	<p>Compute the number of bits required for the string ZQXXFFEEEFX, using Huffman coding.</p> <table border="1"><tr><td>Character</td><td>Z</td><td>Q</td><td>E</td><td>F</td><td>X</td></tr><tr><td>Probability</td><td>0.1</td><td>0.15</td><td>0.4</td><td>0.2</td><td>0.15</td></tr></table>	Character	Z	Q	E	F	X	Probability	0.1	0.15	0.4	0.2	0.15	06	3												
	Character	Z	Q	E	F	X																						
Probability	0.1	0.15	0.4	0.2	0.15																							
c	<p>Define greedy technique, how it differs from dynamic programming?</p>	04	2																									
		<p style="text-align: center;">OR</p>																										
8	a	<p>Apply the bottom-up dynamic programming algorithm to the following instance of the knapsack problem (capacity = 6). Find optional solution indicating the entries in the dynamic programming table.</p> <table border="1"><tr><td>Item</td><td>Weight</td><td>Profit</td></tr><tr><td>1</td><td>3</td><td>25</td></tr><tr><td>2</td><td>2</td><td>20</td></tr><tr><td>3</td><td>1</td><td>15</td></tr><tr><td>4</td><td>4</td><td>40</td></tr><tr><td>5</td><td>5</td><td>50</td></tr></table>	Item	Weight	Profit	1	3	25	2	2	20	3	1	15	4	4	40	5	5	50	06	3						
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	1	3	25																									
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4	4	40																										
5	5	50																										
b	<p>Write an algorithm to find all-pairs shortest path problem for the diagram with the weight matrix.</p> <table><tr><td>0</td><td>2</td><td>∞</td><td>1</td><td>∞</td></tr><tr><td>6</td><td>0</td><td>3</td><td>2</td><td>∞</td></tr><tr><td>∞</td><td>∞</td><td>0</td><td>4</td><td>∞</td></tr><tr><td>∞</td><td>∞</td><td>2</td><td>0</td><td>3</td></tr><tr><td>3</td><td>∞</td><td>∞</td><td>∞</td><td>0</td></tr></table>	0	2	∞	1	∞	6	0	3	2	∞	∞	∞	0	4	∞	∞	∞	2	0	3	3	∞	∞	∞	0	06	3
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3	∞	∞	∞	0																								
c	<p>Compare and contrast dynamic programming and divide and conquer</p>	04	2																									

UNIT-V

9	a	Solve the following Knapsack problem using Branch and Bound method. Maximum Capacity: 10 <table><tr><td>Item</td><td>Weight</td><td>Value</td></tr><tr><td>1</td><td>2</td><td>\$10</td></tr><tr><td>2</td><td>1</td><td>\$6</td></tr><tr><td>3</td><td>3</td><td>\$12</td></tr><tr><td>4</td><td>2</td><td>\$6</td></tr></table>	Item	Weight	Value	1	2	\$10	2	1	\$6	3	3	\$12	4	2	\$6	06	3										
Item	Weight	Value																											
1	2	\$10																											
2	1	\$6																											
3	3	\$12																											
4	2	\$6																											
	b	Write the state space tree for the following problem, if Set $M = \{1,2,3,4,5\}$ and $d_{\text{sum}} = 7$, write the subsets for the problem.	06	3																									
	c	State N-Queens problem. Write solutions for the problem instance, when $N=4$.	04	2																									
OR																													
10	a	Solve the following instance of Assignment problem by branch and bound method. <table><tr><td></td><td>Job 1</td><td>Job 2</td><td>Job 3</td><td>Job 4</td></tr><tr><td>A</td><td>9</td><td>2</td><td>7</td><td>8</td></tr><tr><td>B</td><td>6</td><td>4</td><td>3</td><td>7</td></tr><tr><td>C</td><td>5</td><td>8</td><td>1</td><td>8</td></tr><tr><td>D</td><td>7</td><td>6</td><td>9</td><td>4</td></tr></table>		Job 1	Job 2	Job 3	Job 4	A	9	2	7	8	B	6	4	3	7	C	5	8	1	8	D	7	6	9	4	06	3
		Job 1	Job 2	Job 3	Job 4																								
	A	9	2	7	8																								
B	6	4	3	7																									
C	5	8	1	8																									
D	7	6	9	4																									
b	Solve the following instance of TSP problem by branch and bound method. 	06	3																										
c	Design an algorithm to check whether 2 Queens attack each other or not	04	2																										

Signature of Scrutinizer:

Signature of Chairman

Name:

Name:

