PES University, Bangalore   UC16MC501
(Established under Karnataka Act No. 16 of 2013)

DECEMBER 2017: END SEMESTER ASSESSMENT (ESA) MCA III SEM
UC16MC501- DESIGN AND ANALYSIS OF ALGORITHMS

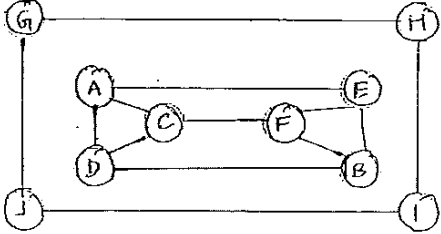Max Marks: 100

Answer All Questions

Time: 3 Hrs

1.	a)	Solve the following	
		i. Using definition method	2.5
		a. Find the Θ notation for $27n^2 + 16n + 25$	
		ii. Using Limits	2.5
		a. Prove that $25n^2 + 5n + 10 = O(n^2)$	2.5
		b. Prove that $2*3^n + 5n2 + 3n = \Theta(3^n)$	
		iii. Using Standard formula	
		a. $\sum_{i=3}^{n+1} i$	2.5
	b)	Explain the procedure for the mathematical Analysis of a Recursive Algorithm. Apply the same on the following algorithm and find the time efficiency of the algorithm.	10
		Algorithm Add(a, n)	
		//Input: A positive integer n and an array a[n] of n numbers	
		//Output: The sum of the n given numbers	
		If n < 0 return 0	
		Else return Add(a, n-1) + a[n]	
2.	a)	Find the shortest path starting from source a and f using Dijkstra's algorithm for the following graph.	5 + 5

	b)	Solve the following Knapsack problem using Dynamic Programming	10

Item	1	2	3	4	
Weight	2	1	3	2	W = 5
Value(Rs.)	120	150	200	150	

3.	a)	The worst-case efficiency of Quick Sort algorithm is $\Theta(n^2)$. When does it occur?	5

		Prove the same.	
	b)	Trace the merge sort algorithm for 8,4,3,2,5,6,1,9. Write the calls encountered during the execution.	5
	c)	Insertion sort is sorting an array A[0..n-1] using the decrease-by-one technique. Write the algorithm for insertion sort. Mention the worst-case and best-case efficiency of the same.	5
	d)	Apply DFS traversal on the graph. Draw the forest.	5
4.	a)	While sorting, it is better to preprocess the problem's input in whole or in part and store the additional information obtained to accelerate solving the problem later – Input Enhancement. For the given numbers 65, 28, 87, 93, 22, 44 which algorithm using Input Enhancement should be used for sorting. Write the algorithm and trace the same.	10
	b)	Heapify the following list using the bottom-up approach - 2, 3, 7, 6, 1, 8, 4, 9, 5	5
	c)	Write the algorithm to delete the maximum key from a heap.	5
5.	a)	Solve the assignment problem using branch and bound technique $\begin{bmatrix} 4 & 1 & 3 & 2 \\ 4 & 1 & 5 & 1 \\ 2 & 2 & 3 & 2 \\ 8 & 4 & 2 & 3 \end{bmatrix}$	10
	b)	Define 1. Tractable　　2. Hamiltonian Circuit　3. Class P　4. Performance Ratio 5. Accuracy Ratio　6. Intractable　　7. Lower Bound　　8. Decision Tree	(1*6 + 2+2)