B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

September / October 2023 Semester End Main Examinations

Programme: B.E. **Semester: IV**
Branch: Computer Science & Engineering **Duration: 3 hrs.**
Course Code: 22CS4PCADA **Max Marks: 100**
Course: Analysis and Design of Algorithms **Date: 22.09.2023**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

			UNIT - I	**CO**	**PO**	**Marks**
1	a)		Describe Asymptotic notations with an example, equation and graph.	CO1	PO1	**6**
	b)		Design a recursive algorithm to find maximum and minimum element in an array and derive its time complexity.	CO1	PO1,2,3	**8**

	c)		Analyze the code given below and find the time complexity:
			void function (int n)
			{
			  int count = 0;
			  for (int i=n/2; i<=n; i++)
			    for (int j=1; j<=n; j = 2 * j)
			      for (int k=1; k<=n; k = k * 2)
			        count++;
			}
				CO1	PO2	**6**

			UNIT - II			
2	a)		Mention the applications of Depth First Search (DFS) algorithm. Apply DFS method to find the topological sequence for the graph shown below. Also write an algorithm for the same. 	CO2,4	PO1,2,3	**10**
	b)		Solve the following assignment problem using Exhaustive Search technique, whose matrix for assigning four jobs to four persons are given:	CO2,4	PO1,2,3	**10**

	J1	J2	J3	J4
Person A	3	21	7	9
Person B	18	13	10	15
Person C	29	19	17	12
Person D	32	30	26	28

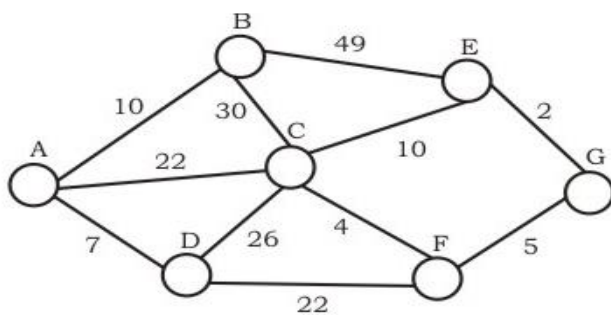|					
			OR		
3	a)	Demonstrate with an example Brute Force pattern matching technique. Write an algorithm for the same and find its time complexity.	CO2,4	PO1,2,3	**10**
	b)	Write a program to check whether a particular given node is reachable from a given source node using DFS traversal technique. If yes, print "Node is accessible", otherwise print "Node is not accessible".	*CO2*	*PO1*	**10**
			UNIT - III		
4	a)	Apply Merge sort to sort the list {E, X, A, M, P, L, E} in alphabetical order.	CO2,4	PO1,2,3	**10**
	b)	Construct a Max Heap for the following list of keys and sort the list using Heap Sort technique. Write the algorithm for Max Heap. **{2,9,7,6,5,8}**	CO2,4	PO1,2,3	**10**
			OR		
5	a)	State Horner's rule with an algorithm. Apply Horner's rule to evaluate the following polynomial: $5x^4 + 2x^3 - 3x^2 + x - 7$ at the point x=3.	CO2	PO1,2	**10**
	b)	Demonstrate the Strassen's Matrix Multiplication method with an example.	CO2	PO2	**10**
			UNIT - IV		
6	a)	Analyze time efficiency of Prim's algorithm. Apply Prim's algorithm to find the minimum cost spanning tree for the graph shown below:	CO2,4	PO1,2,3	**10**
	b)	Construct a Huffman tree and find the code word for the following data:	CO2,4	PO1,2	**10**

Character	A	B	C	D	E	-
Frequency	0.5	0.35	0.5	0.1	0.4	0.2

Using above code, Encode the text DAD_CBE and decode the text 1000010111001010.

			UNIT - V		
7	a)	Solve the following instance of 0/1 Knapsack problem using Branch and Bound with capacity C=10. Items={1,2,3,4} Weights={4,7,5,3} Values={$40, $42, $25,$12}	CO2,4	PO1,2	**10**
	b)	Describe the P and NP class problems with examples. Illustrate NP Completeness proof by Reduction.	CO3	PO1,2	**10**

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