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

Autonomous Institute Affiliated to VTU

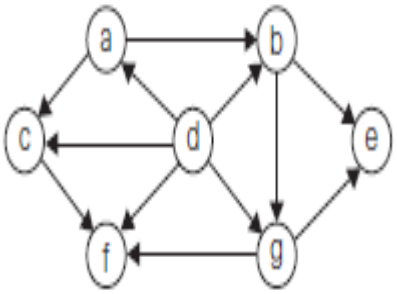
October 2024 Supplementary Examinations

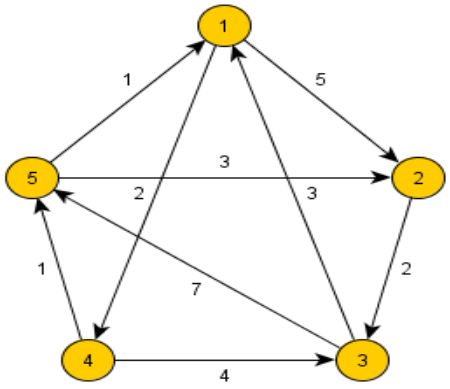
Programme: B.E. **Semester: IV**
Branch: CSE (ICB), AI&DS, CSE (DS) **Duration: 3 hrs.**
Course Code: 23DC4PCDAA **Max Marks: 100**
Course: Design and Analysis of Algorithms

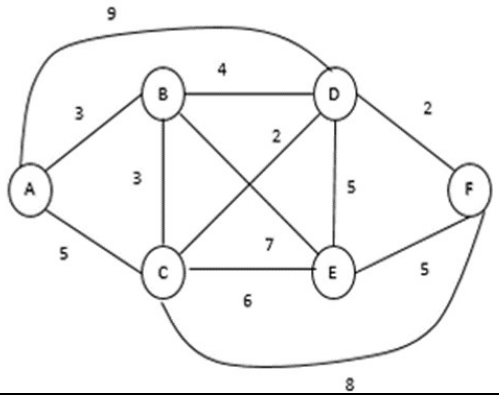
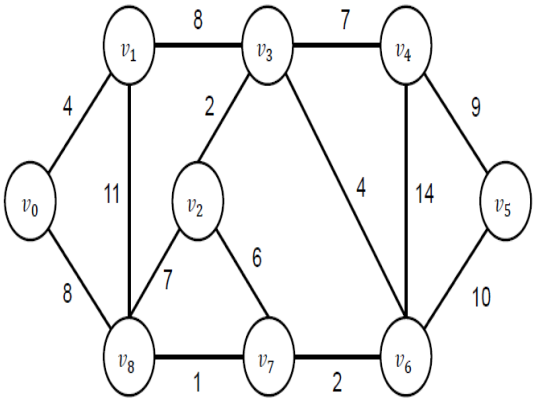
Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

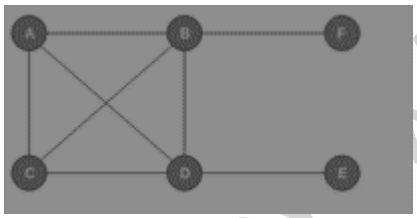
			CO	PO	Marks
		UNIT - I			
1	a)	Demonstrate with an example Worst case, Best case time complexity of an algorithm.	*CO1*	*PO1*	**06**
	b)	Discuss the general plan to find the efficiency of recursive algorithms. Apply the same to find the efficiency of solving Tower of Hanoi problem.	*CO1*	*PO1*	**08**

	c)	Analyze the time complexity for the following codes. Show the steps clearly.
		`int a = 0, i = N;`
		`while (i > 0) {`
		`  a += i;`
		`  i /= 2;`
		`}`
		
		`int recursivefun (int n)`
		`{`
		`if(n<=0)`
		`return 1;`
		`else`
		`return 1+ recursivefun (n/5)`
			CO2	*PO2*	**06**

		UNIT - II			
2	a)	Differentiate between different variations of Decrease and Conquer technique with an example.	*CO2*	*PO2*	**06**
	b)	Apply Johnson Trotter method to generate permutations for the set {4,5,6}. Write the algorithm for the same.	*CO2*	*PO2*	**06**
	c)	Apply the DFS-based algorithm and source removal method to solve the topological sorting problem for the following digraph. Also prove that the topological sorting problem has a solution if and only if it is a DAG. 	*CO3*	*PO3*	**08**

			UNIT - III			
	3	a)	Apply Strassen's matrix multiplication to multiply following matrices. Discuss how this method is better than the direct matrix multiplication. $\begin{bmatrix}3 & 1\\4 & 2\end{bmatrix} * \begin{bmatrix}2 & 3\\5 & 6\end{bmatrix}$	*CO2*	*PO2*	**07**
		b)	Write the bottom up algorithm for Heap construction. Construct a heap for the list 1, 8, 6, 5, 3, 7, 4 by using bottom-up algorithm.	*CO1*	*PO1*	**07**
		c)	Illustrate the tracing of Quicksort algorithm for the following set of numbers. 54, 26, 93, 17, 77, 31, 44, 55, 20	*CO2*	*PO2*	**06**
			OR			
	4	a)	Consider the problem of searching for genes in DNA sequences using Horspool's algorithm. A DNA sequence is represented by a text on the alphabet {A, C, G, T}, and the gene or gene segment is the pattern. a. Construct the shift table for the following gene segment. TCCTATTCTT b. Apply Horspool's algorithm to locate the above pattern in the following DNA sequence: CGTATTCTTTTATAGATCTCCTATTCTT	*CO3*	*PO3*	**08**
		b)	Apply Horner's rule to evaluate the polynomial $p(x) = 3x^4 - x^3 + 2x + 5$ at $x = -2$.	*CO2*	*PO2*	**06**
		c)	Is Merge sort better than Quick sort, in the worst case. Justify your answer by deriving the time complexities for both in worst case.	*CO1*	*PO1*	**06**
			UNIT - IV			
	5	a)	Apply Floyd's algorithm to find all pair shortest path for the given graph below.  	*CO1*	*PO1*	**06**

		b)	In a telephone network, each line has a bandwidth, *bw*. The bandwidth of transmission line is the highest frequency that that line can support. Imagine a city to be a graph, the vertices represent the switching stations, and the edges represent the transmission lines and the weight of the edges represent *bw*. Use appropriate algorithm to establish the call through lowest Bandwidth. Assume the connection has to be established from A.  	*CO2*	*PO1*	**08**
		c)	The characters a to h have the set of frequencies based on the first 8 Fibonacci numbers as follows: a : 1, b : 1, c : 2, d : 3, e : 5, f : 8, g : 13, h : 21 A Huffman code is used to represent the characters. What is the sequence of characters corresponding to the following code? 1101111001110101	*CO3*	*PO3*	**06**
			OR			
	6	a)	Obtain the solution for a knapsack problem using dynamic method with knapsack capacity M=6, n=3, (w1, w2, w3) = (1, 2, 3) and (p1, p2, p3) = (10, 15, 40). Analyze its efficiency	*CO2*	*PO2*	**08**
		b)	Using the modified prim's algorithm to find the maximum spanning tree for the following graph.  	*CO3*	*PO3*	**08**
		c)	For the following instance of coin row problem, apply dynamic programming approach. Coin Denominations: 6, 2, 9, 11, 7, 4	*CO1*	*PO1*	**04**

			UNIT - V			
	7	a)	Solve the following instance of the knapsack problem by the branch and bound algorithm. Assume knapsack weight is W=15. **Item** | **Weight** | **Profit** 1 | 5 | 40 2 | 7 | 35 3 | 2 | 18 4 | 4 | 4 5 | 5 | 10 6 | 1 | 2	*CO* 2	*PO2*	**08**
		b)	Show the state space tree for finding sum of subset for the set X={5,8,13} with d=13 using Backtracking technique. Show all the solutions.	CO2	*PO2*	**06**
		c)	Write Approximation Vertex Cover Algorithm. Apply the Approximation Vertex Cover Algorithm for the following graph and find the vertex cover for the same. 	CO2	*PO2*	**06**

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