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(An Institute of National importance under Ministry of Education, Govt. of India)

संगणक विज्ञान एवं अभियांत्रिकी विभाग

Department of Computer Science and Engineering

End Term Examination, November 2024

Course: B. Tech. **Semester:** 3rd **Branch:** CSE

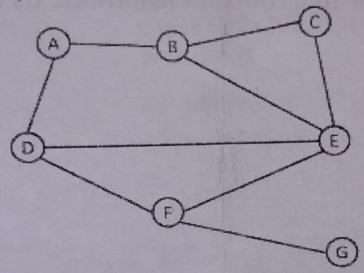
Subject Code: CSE-211 **Subject Name:** Data Structure **Max Marks:** 50

Notes: All questions are compulsory, each question carries equal 10 marks each.

Q.No.	Question	Marks	COs

1	a)- Consider the following code for fun(100) and determine its time complexity:
	`int fun(int n){`
	`int i, j, m=0;`
	`for (i=n; i<=0; i=i/2){`
	`for(j=0; j<=i; j++) {`
	`m+=1;`
	`}`
	`}`
		03	CO2

	b) Give example of algorithms that have following time complexity order. *Give reason for your answer*: O(logn), O(nlogn), O(n^2), O(n).	02	
	c) Write an algorithm for implementing queue operations *using stack*.	05	
2	a)- Consider a collection of n data items A_1 to An in random order. Suppose we want to find all duplicate items in the collection. How can this be achieved using: 1. **Array** 2. **Binary Search Tree** *Discuss the steps and calculate the time complexity in both cases.*	05	CO1
	b) *Write an algorithm for addition of two polynomials stored using linked list. Analyze the time complexity of the algorithm.*	05	
3	a) What are the maximum and minimum sizes of a linked list and an array required to ~~sort~~ store a Binary Search Tree (BST) of height h?	03	CO3
	b) For a binary tree, the pre-order and in-order traversal sequences are: **Pre-order**: G, B, Q, A, C, K, F, P, D, E, R, H **In-order**: Q, B, K, C, F, A, G, P, E, D, H, R Construct the binary tree and explain each step.	02 05	
	c) Construct an AVL tree by inserting the following elements 64, 1, 40, 50, 13, 110, 96, 84, and 90 in the given order, ensuring the tree remains balanced after each insertion. Once the tree is constructed, delete element 13 and show the resulting AVL tree.		
4	a)- Write an algorithm to create a heap using the Heapify method and analyze the time complexity of the algorithm. A company has the following salaries (in thousands of rupees) that need to be sorted in ascending order: [45, 25, 60, 15, 30, 10, 50]. Use priority queue implementation as a binary heap to sort the salaries with Heap Sort.	05 05	CO4

	b)-Given the list of integers 45, 12, 33, 22, 10, 89, 77, perform Insertion Sort to arrange the elements in ascending order. What will be the worst case and best case input for insertion sort if the list is stored in an array and in a singly linked list.		
5	a)-Given a hash table of size 7, hash functions $H_1(X) = ((X+5)\% 7)$, $H_2(X) = ((X+11)\%7)$ and the elements [100,350,420,500,800,700,200] in given order, illustrate the state of hash table when collisions are resolved using: a) Linear Probing (using $H_1(X)$) b) Quadratic Probing (using $H_1(X)$) c) Use $H_2(X)$ for double hashing and show the output. Show the computations involved and total collisions encountered in each.	05	CO5
	b) Traverse the graph considering the source vertex as A. using Depth First Search (DFS) and Breadth First Search (BFS) traversal employing suitable data structure. Show the steps for each algorithm for the graph,  	05	

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