PVP 23

Code: 23CS3301, 23AM3301, 23DS3301

II B.Tech - I Semester – Regular Examinations - DECEMBER 2024

ADVANCED DATA STRUCTURES AND ALGORITHM ANALYSIS

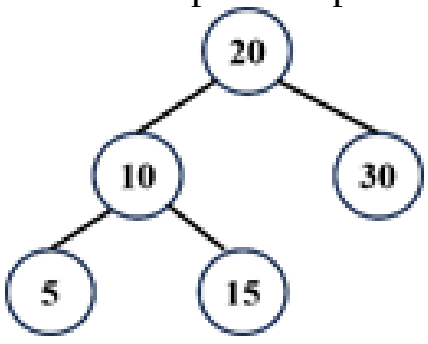
(Common for CSE, AIML, DS)

Duration: 3 hours Max. Marks: 70

Note: 1. This question paper contains two Parts A and B.
2. Part-A contains 10 short answer questions. Each Question carries 2 Marks.
3. Part-B contains 5 essay questions with an internal choice from each unit. Each Question carries 10 marks.
4. All parts of Question paper must be answered in one place.

BL – Blooms Level CO – Course Outcome

PART – A

		BL	CO
1.a)	Given the growth rate of standard function as shown below, arrange them in ascending order of time complexity. i)n^3 ii) nlog(n/5) iii) 2^{n+1} iv) log(n+1) e) n/2	L2	CO1
1.b)	Given the AVL tree in figure, insert the node 27 to the tree and rebalance if the tree is unbalanced, mark the balance factors in each step of the process. 	L3	CO3
1.c)	Define heap data structure. What are the operations on heap.	L2	CO3
1.d)	Define the path and cycle of a graph. Give an example.	L1	CO3
1.e)	What is the time complexity of Quick Sort and Merge Sort algorithm.	L2	CO1

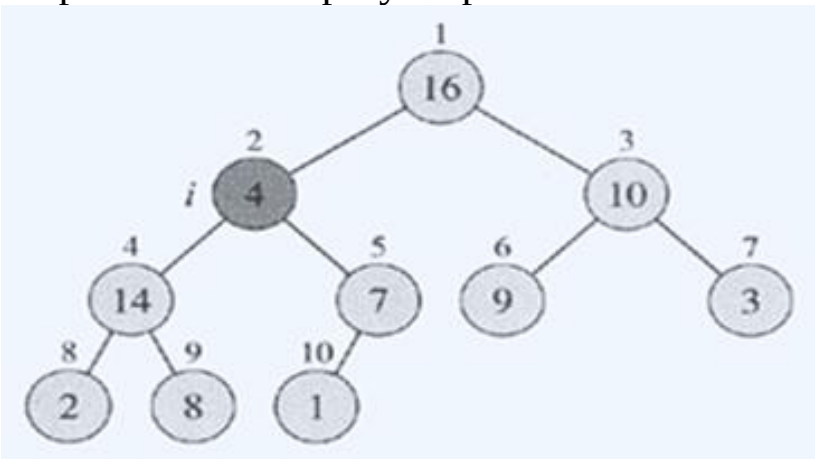
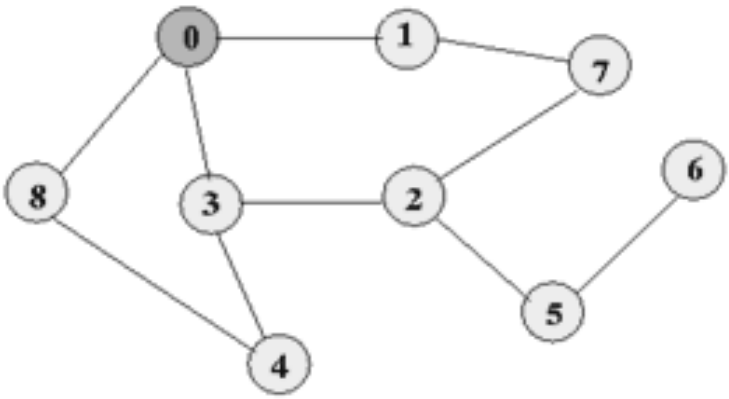
1.f)	Packets in a buffer on a router have arrived in the following order: i)Pkt12; t=0.2745s ;P5 ii)Pkt06 ; t=1.1376s ;P3 iii)Pkt21; t=1.8953s ;P2 iv)Pkt24 ; t=2.0012s ;P1 v)Pkt17; t= 1.003s; P4 P1(Highest),P2,P3,P4,P5(Lowest) indicate the priority of the packets and t is the time arrival of the packets. What is the order in which these packets are arranged in a priority queue?	L3	CO4
1.g)	Match the following: i) Knapsack a) $O(2^k)$ ii) Binary Search b) O(n log(n)) iii) Merge sort c) $O(n^3)$ iv) Matrix Multiplication d) O(log(n))	L2	CO4
1.h)	Give any two differences between Dijkstra's algorithm and Bellman-Ford algorithm.	L2	CO1
1.i)	Give examples for NP complete and NP hard problems.	L2	CO1
1.j)	What is the time complexity of n-queen problem?	L2	CO1

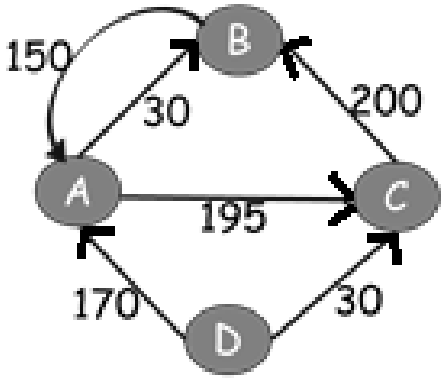
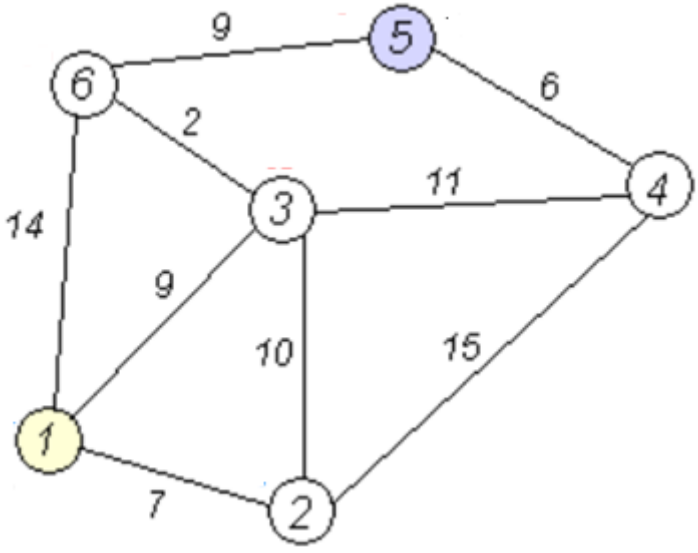
PART – B

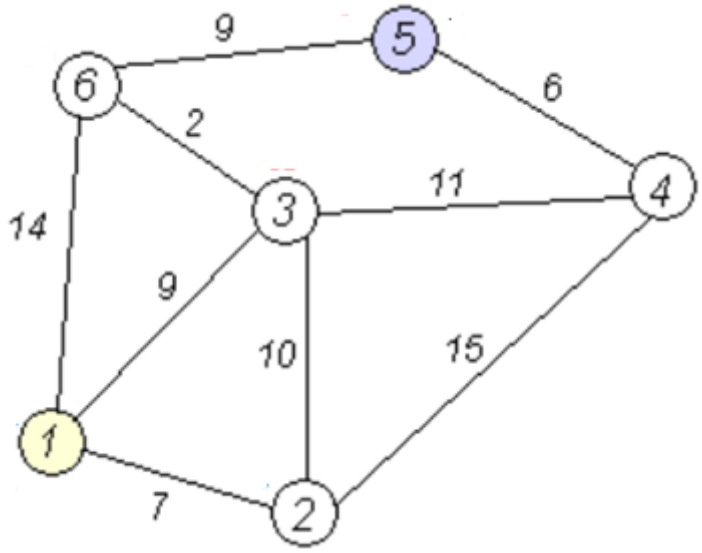
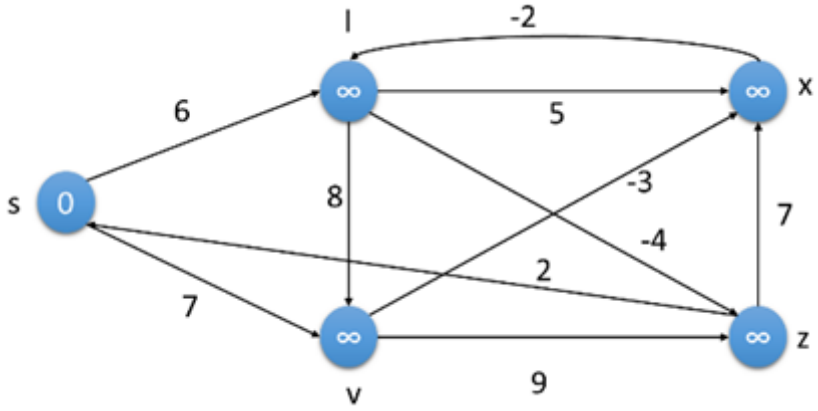
			BL	CO	Max. Marks
UNIT-I					
2	a)	Construct an AVL tree by inserting the following elements in the given order. 37, 63, 108, 21, 85, 99.Now delete 108 form this tree. Rebalance if necessary.	L3	CO3	5 M

	b)	Define i) Time Complexity and ii) Space Complexity. For the given Algorithm, find the worst-case time complexity. Express your answer in big O notation. Show each step of the calculations.
		Algorithm sum(a,n)
		{
		s=0.0;
			L2	CO1	5 M

		for i=1 to n do
		s=s+a[i];
		return s;
		}			

OR					
3		Compare and contrast B-trees with Binary trees and give their time complexities. Show the results of inserting the keys 6, 19, 17, 11, 3, 12, 8, 20, 22 in the given order into an empty B-Tree with minimum degree t=2.	L3	CO3	10 M
UNIT-II					
4	a)	Using the property of Min Heap, Heapify the above give graph to get the min heap. Give the complete details step-by-step.  	L3	CO3	5 M
	b)	For the given graph, find the breadth first search traversal. Give the details of each step.  	L3	CO3	5 M
OR					
5	a)	Define the following terms with examples i)Graph ii)Vertex of a graph	L2	CO1	5 M

		iii)Isolated graph iv)Forest v)Graph with negative weight. Mention what does negative weight indicate.			
	b)	For the given graph, write the adjacency matrix and adjacency list. 	L3	CO3	5 M
UNIT-III					
6	a)	Given the sequence of numbers as follows: 23, 89, 45, 32, 9, 56, 84, 93, 66, 19, 83, 64. sort these numbers using Merge Sort.	L3	CO4	5 M
	b)	For the given graph, determine minimum spanning tree using Kruskal's algorithm. Write the complete details of the steps. 	L3	CO3	5 M
OR					
7	a)	Find the shortest path between the vertex 6 and vertex 4 using all-pair shortest path algorithm for the following graph.	L3	CO3	5 M

					
	b)	Explain with example, the job sequencing scheduling based on first-cum-first-serve principle.	L2	CO4	5 M
UNIT-IV					
8	a)	Using Bellman-Ford algorithm, determine the shortest path between I and Z. 	L3	CO4	5 M
	b)	Find an optimal solution using dynamic programming for the following 0/1 knapsack instance n=4, m=5, (p1,p2,p3,p4)=(4,5,3,7) and (w1,w2,w3,w4)=(2,3,1,4)	L3	CO4	5 M
OR					
9	a)	Give two sequences X=(A, B, C, B, D, A, B) and Y=(B, D, C, A, B, A). use dynamic programming approach to find the Longest Common Sequence(LCS) of X and Y.	L3	CO4	5 M
	b)	Explain the principle of optimality with example and state why this principle is necessary?	L2	CO4	5 M

UNIT-V					
10	a)	Explain the following with examples: P class; NP class and NP-complete class with examples.	L2	CO1	5 M
	b)	Explain n-queens problem using backtracking approach.	L2	CO4	5 M
OR					
11	a)	Explain graph coloring problem with an example.	L2	CO4	5 M
	b)	Write backtracking algorithm for sum of subsets problem.	L2	CO4	5 M