PVP 23

Code: 23CS3301, 23AM3301, 23DS3301

II B.Tech - I Semester – Supplementary Examinations - MAY 2025

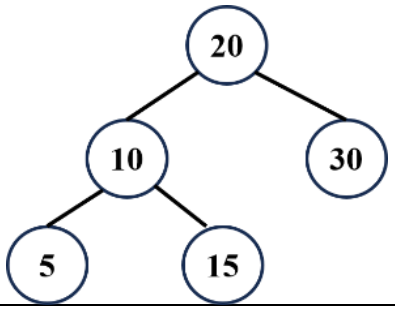
ADVANCED DATA STRUCTURES AND ALGORITHM ANALYSIS

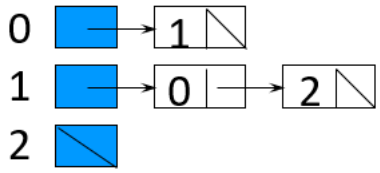
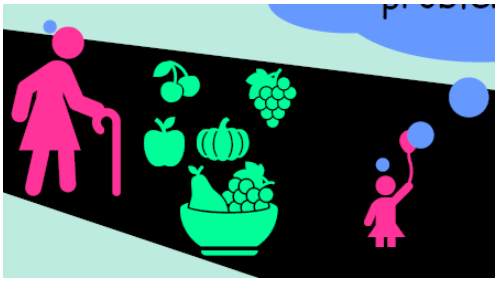
(Common for CSE, AIML, DS)

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.

PART – A

1.a)	Given the AVL tree in figure 1, delete node 30 and rebalance if the tree if it is unbalanced after deleting. Note you have to mark the balance factors in each step of the process. 
1.b)	Given the growth rate of standard function as shown below, arrange them in ascending order of time complexity. i)n^3 ii)) nlog(n) iii) 2^n iv) log(n) v) n
1.c)	Given the information that you are working on Heaps and three functions are given as follows, fill the blanks. You are given sample for Right( ) function. **Right(i)** **Return ____2*i+1___** Fill in the blanks accordingly. Parent(i)

	Return _____ Left(i) Return _____
1.d)	For the adjacency list shown in figure, draw the graph. 
1.e)	Quick Sort and Merge Sort are based on which of the following paradigm? Explain that mechanism briefly. i)Dynamic Programming ii)Divide and Conquer iii)Backtracking iv)Greedy Approach
1.f)	Packets in a buffer on a router have arrived in the following order: i)Pkt12 – t=0.2745s – P2 ii)Pkt06 – t=1.1376s – P3 iii)Pkt21 – t=1.8953s – P2 iv)Pkt24 – t=2.0012s – P1 here P1, P2, and P3 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 buffer based on priority?
1.g)	In this picture, the grandmother is pondering about which items to carry in the basket to market today so that she can make maximum profit. Her grand-daughter says “I can help you by providing you a solution using an algorithm”. Which algorithm is used by the grand-daughter? 

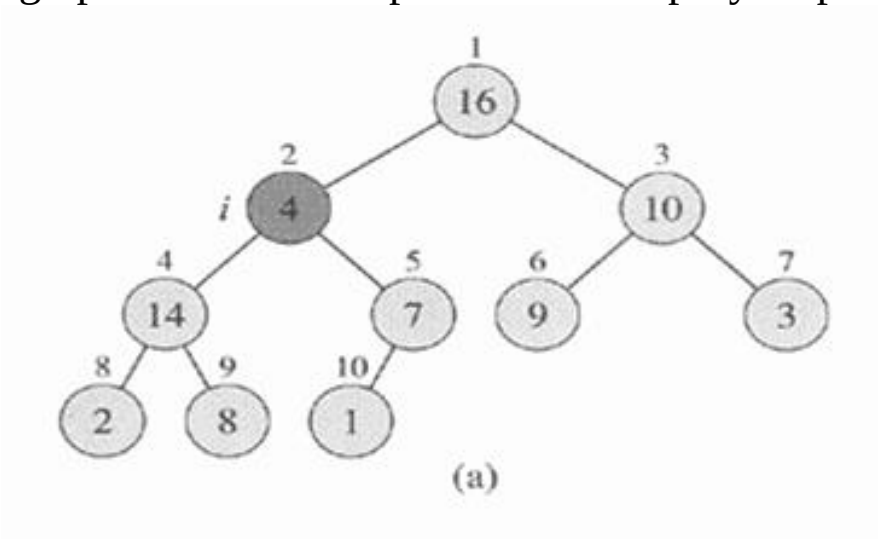
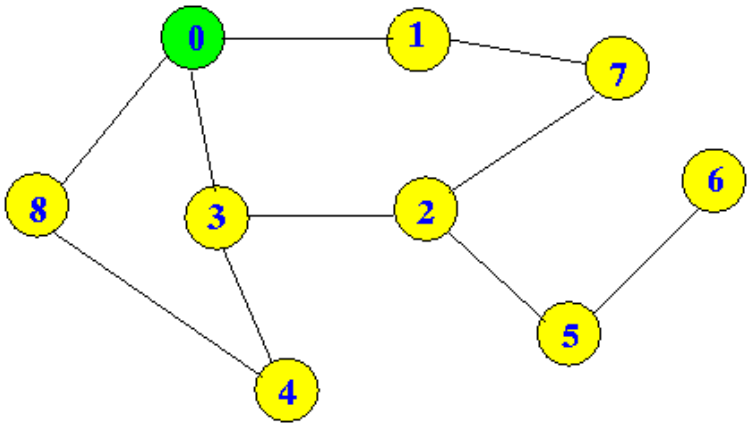
	i)Traveling salesman problem ii)Optical binary search trees method iii)0/1 Knapsack problem iv)None of these
1.h)	Give 4 differences between All-pair shortest path algorithm and single source shortest path algorithm.
1.i)	Define NP complete problem and identify which of the following is an NP complete problem? i)Calculating chromatic number of graph ii)Hamiltonian cycle iii)Finding maximum element in an array iv)Travelling salesman problem
1.j)	What is the time complexity of 4-queen problem?

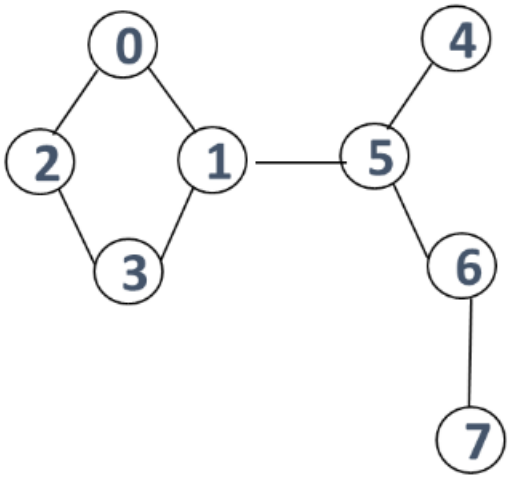
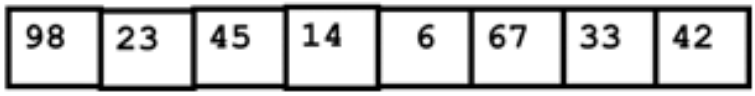
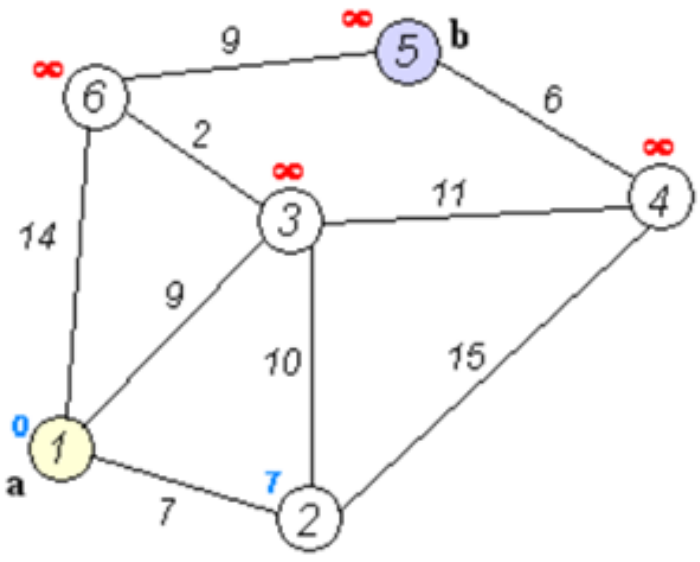
PART – B

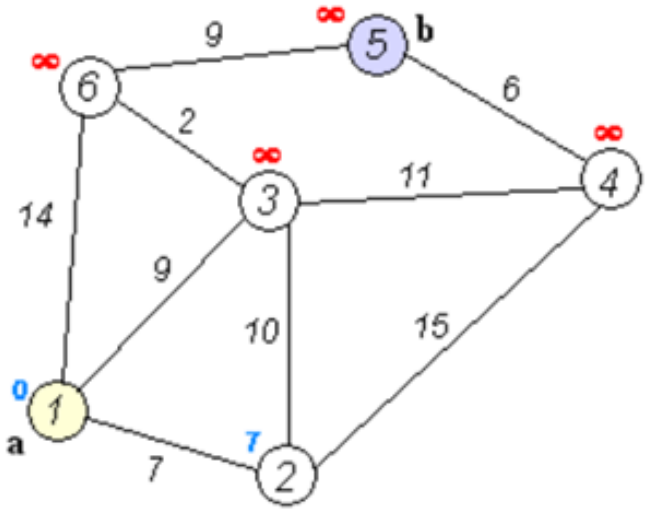
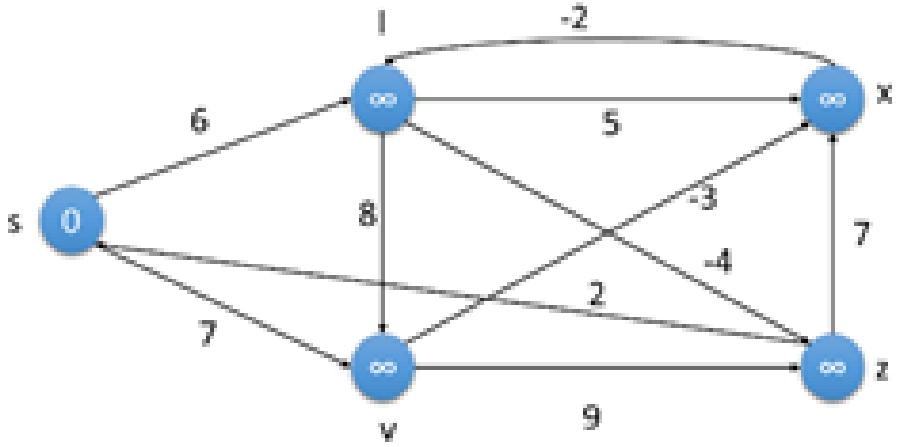
					Max. Marks
UNIT-I					
2	a)	Construct an AVL tree by inserting the following elements in the given order.63, 9, 19, 27, 18, 108, 99, 81.			5 M

	b)	Define i) Time Complexity and ii) Space Complexity. For the given code snippet, find the worst-case time complexity. Express your answer in big O notation. Show each step of the calculations.
		…
		for j = 1 to n do
		for k = 1 to n do
		x = x + 2
		end
		end
		…
					5 M

OR					
3	a)	Write an algorithm to add two matrices and mention its time complexity.			5 M
	b)	What is a B-tree?			5 M

		Explain its need (application)? List any 3 properties of B-Trees.	
		UNIT-II	
4	a)	Using the property of Max Heap, Heapify the above give graph. Give the complete details step-by-step.  (a)	5 M
	b)	For the given graph, find the depth first search traversal. Give the details of each step.  	5 M
		OR	
5	a)	Define the following terms with examples i)Graph ii)Weighted and Unweighted Graph iii)Directed and Undirected Graph iv)Diameter of the network v)Path of a graph	5 M
	b)	For the given graph, write the adjacency matrix and adjacency list.	5 M

			
		UNIT-III	
6	a)	Given the sequence of numbers as shown in figure, sort these numbers using: i)Merge Sort Write the time complexity for each case. 	5 M
	b)	For the given graph, determine minimum spanning tree using Prim's algorithm. Write the complete details of the steps. 	5 M
		OR	

7	a)	For the given graph find the shortest path between the vertex 6 and vertex 4 using Dijkstra's algorithm. 	5 M
	b)	Explain with example, the job sequencing scheduling based on priority.	5 M
		UNIT-IV	
8	a)	Using Bellman-Ford algorithm, determine the shortest path between S and Z. 	5 M
	b)	Explain the traveling salesman problem with neat diagram and example.	5 M
		OR	
9	a)	Give 5 differences between single source shortest path algorithm and all-pair shortest path algorithm.	5 M
	b)	Using the concept of dynamic programing explain the principle of optimality.	5 M

UNIT-V			
10	a)	Explain the following with examples:N class; NP class and P complete algorithms with examples.	5 M
	b)	Explain 4-queens problem using backtracking approach.	5 M
OR			
11	a)	Explain graph coloring problem with an example.	5 M
	b)	Explain 0/1 Knapsack problem with an example.	5 M