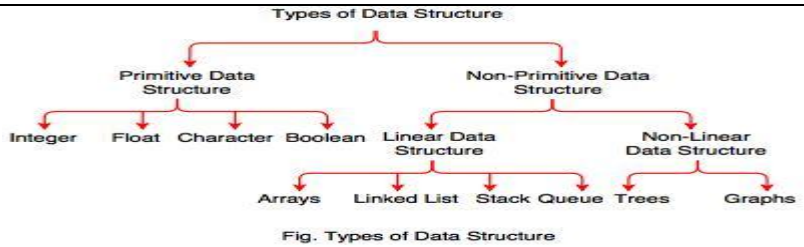
	E.G.S. PILLAY ENGINEERING COLLEGE (An Autonomous Institution, Affiliated to Anna University, Chennai) Nagore Post, Nagapattinam – 611 002, Tamilnadu.	Rev.0 COE/2017/QB

17CA 104DATA STRUCTURES				
Academic Year :	2018-2019	**Question Bank**	Programme :	MCA
Year / Semester :	I / I		Course Coordinator:	Mrs. C.Mallika

Course Objectives	**Course Outcomes:**
The student should be able to 1. To understand the linear and common data structure in solving problems. 2. To know about the hierarchical data structures and its applications. 3. To learn about sorting techniques and hashing techniques. 4. To develop applications using graph data structure in real word applications. 5. To design and implementation of various basic and advanced data structure	Upon completion of this course, the student will: i) Describe the linear data structure. ii) Implement Tree traversal for given applications. iii) Explain the sorting techniques. iv) Describe the hashing techniques. v) Develop applications using graph data structure. Vi Explain searching, inserting, deleting and traversing mechanism of AVL trees. vii) Describe the types of binary heap.

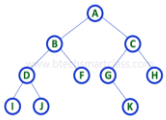
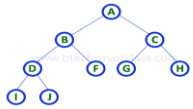
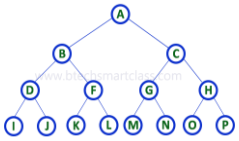
PART – A (2 Mark Questions With Key)				
S.No	**Questions**	**Mark**	**COs**	**BTL**
UNIT I LINEAR DATA STRUCTURES – LIST, STACK AND QUEUE			**9 + 3**	
Abstract Data Types (ADTs) – List ADT – Array-Based Implementation – Linked List Implementation – Doubly-Linked Lists – Circular Linked Lists – Applications – Cursor-Based Implementation of Linked Lists – Stack ADT: Implementation of Stacks – Applications - Queue ADT: Implementation of Queues – Applications of Queues-Priority Queues.				
1.	**Define Array? Write the limitations of Array.**	2		K1
	An array is a collection of elements of similar data type that are referred to through a common name .it is simply a grouping similar data items			
2.	**Define Data structure? What are different types of data structure?**		1	
	The way information is organized in the memory of a computer is called a data structure.	2		
	 Fig. Types of Data Structure			K2
3.	**What is abstract data type?**			K2
	Abstract data type (ADT) is a specification of a set of data and the set of operations that can be performed on the data.	2		
4.	**Define Stack? What are the operations allowed in stack?**			K2
	Stack is an ordered collection of elements in which insertions and deletions are restricted to one end. The end from which elements are added and/or removed is	2		

	referred to as top of the stack. Stacks are also referred as piles, push -down lists and last -in-first -out (LIFO) lists. Operations: PUSH,POP, Peek, Empty			
5.	**Write any four applications of stack?**			K2
	Towers of Hanoi, Reversing a string, Balanced parenthesis, Recursion using stack, Evaluation of arithmetic expressions	2		
6.	**Define queue?**			K2
	• Queue is a linear data structure where the first element is inserted from one end called **REAR** and deleted from the other end called as **FRONT**. Queues are also referred as First -In-First -Out (FIFO) Lists.	2		
7.	**Mention some applications of queue?**			K2
	Jobs submitted to printer Real life line · Calls to large companies, Ticket counter	2		
8.	**What is priority queue?**			K2
	Priority queue is a data structure in which the intrinsic ordering of the elements Determines the results of the basic operations like insertion and removal.	2		
9.	**Difference between Array, Stack and Queue?**			K2
	A queue is a first-in-first-out data structure A stack is a first-in-last-out data structure. An array is data structure (type of memory layout) that stores a collection of individual values that are of the same data type	2		
10.	**What are the applications of linked list?**			K2
	Polynomials, sparse matrices, stacks and queues.	2		
11.	**What is a node?**			K2
	Each structure in a linked list called node, two fields 1.data 2.address	2		
12.	**What are the advantages of linked list?**			K2
	1.dynamic data structure 2.Not waste memory 3.not specify the size 4. flexibility	2		
13.	**Difference between Array and Linked list.?**			K2
	1.Size of an array is fixed It is necessary to specify the number of elements during declaration 2.Insertions and deletions are somewhat difficult 3.It occupies less Memory	1.Size of a list is variable It is not necessary to specify the number of elements during declaration 2.Insertions and deletions are carried out easily 3.It occupies more memory	2	
14.	**What are the various types of address stored in linked list?**	2		K2
	External Address, Internal Address, Null Address			
15.	**Why we need cursor implementation of linked lists?**			K2
	Many languages such as BASIC and FORTRAN do not support pointers. If linked lists are required and pointers are not available, then an alternative implementation must be used known as cursor implementation.	2		

UNIT II HIERARCHICAL DATA STRUCTURES 9 + 3

Trees: Preliminaries – Implementation of Trees – Tree Traversals with an Application - Binary Trees: Implementation – Expression Trees – Search Tree ADT: Binary Search Trees.

1	**What is the purpose of non linear data structures?**		2	K2
	A non-linear data structure is a data structure in which a data item is connected to several other data items.	2		
2.	**Define tree?**			K2
	A tree is a collection of nodes. A tree consists of a root and zero or more sub trees T1, T2……TK each of whose roots are connected to root.	2		K2
3.	**What is binary tree?**			K2

	A tree in which every node can have a maximum of two children is called as Binary Tree. The root, left subtree and right subtree. 	2		
4.	**What is mean by siblings?**			K2
	The node are said to be siblings if they have the same parent	2		
5.	**Define expression trees?**			K2
	The leaves of an expression tree are operands such as constants or variable names and the other nodes contain operators	2		
6.	**What is strictly binary tree (or) full binary tree?**	2		K2
	A binary tree in which every node has either two or zero number of children is called Strictly Binary Tree 			
7.	**What do you mean by complete binary tree?**			K2
	A binary tree in which every internal node has exactly two children and all leaf nodes are at same level is called Complete Binary Tree. 	2		
8.	**Define almost complete binary tree?**			K2
	A binary tree of depth d is an almost complete binary tree if: i) Each leaf in the tree is either at level d or level d-1. ii) For any node and in the tree with the right descendant at level d, all the left descendants that are leaves should also be at level d	2		
9.	**Define height of the node in a tree?**			K2
	The height of node n i the length of the longest path from n ito a leaf	2		
10.	**Give various implementations of binary tree?**			K2
	Linear Representation Linked Representation	2		
11.	**What do you mean by External nodes and Internal nodes?**			K2
	The non leaf nodes are called internal nodes where as leaf nodes are called external nodes	2		
12.	**What is binary search tree?**			K2
	Binary Search Tree is a binary tree in which every node contains only smaller values in its left subtree and only larger values in its right subtree.	2		
13.	**List the applications of binary tree?**			K2
	Expression parsers routing table Data compression	2		
14.	**What are the advantages of binary tree linked representation over array representation?**			K2
	Deletions in a binary search tree leads to tree s which are not equally likely. Absence of balanced search tree. 3. The average depth is not O (log N) in trees which are not equally likely.	2		
15.	**Draw the binary tree for the Expression? A-B*C/D.**			K2
	AB-CD/*	2		

UNIT III SORTING AND HASHING **9 + 3**

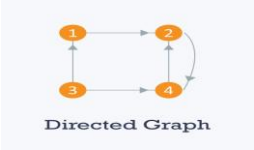
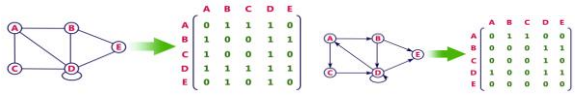
Sorting – Bubble sort - Quick Sort - Insertion Sort – Heap sort – Hashing -Hashing functions - Collision Resolution Techniques - Separate chaining - Open addressing – Multiple hashing.

1.	**What is meant by Sorting?**			K1
	Ordering the data in an increasing or decreasing fashion according to some relationship among the data item is called sorting	2		
2.	**What are the two main classifications of sorting?**			K2
	Internal sorting, external sorting	2		
3.	**What is meant by external sorting?**			K2
	External sorting is a process of sorting in which large blocks of data stored in storage devices are moved to the main memory and then sorted	2		
4.	**What is meant by internal sorting?**			K2
	Internal sorting is a process of sorting the data in the main memory	2		
5.	**What is meant by Bubble sort?**			K2
	It is to pass through the file sequentially several times. Pass X[I]with x[i+1]	2	3	
6.	**What is the purpose of Quick sort?**			K3
	The purpose of the quick sort is to move a data item in the correct direction, just enough for to reach its final place in the array			
7.	**What is the advantage of Quick sort?**			K2
	Reduce unnecessary swaps and moves an item to a greater distance is one move	2		
8.	**Show the best case time complexity of Quick sort?**			K3
	O(nlogn)	2		
9.	**What is the average efficiency of Heap sort?**			K3
	O(nlogn)	2		
10.	What is the Complexity of the Insertion Sort Algorithm			K3
	Worst Case : O(n2) Best Case : Ω(n) Average Case : Θ(n2)	2		
11.	**Define hashing?**			K3
	Hashing is the process of indexing and retrieving element (data) in a data structure to provide faster way of finding the element using the hash key.	2		
12.	**Define Hash functions?**			K2
	Hash function maps each key into some number in the range 0 to Tableaize-1and places the key in the appropriate cell.	2		
13.	**What you mean by collision?**		4	K2
	If an element is inserted and if it hashes to the same value as an already inserted element collision takes place.	2		
14.	**Classify the types of Collision resolution techniques. ?**			K2
	Separate chaining hashing. Open addressing hashing.	2		
15.	**List the types of hash function?**			K2
	Division method Mid square Multiplicative hash function Digit folding Digit analysis	2		

UNIT IV GRAPHS 9 + 3

Definitions – Representation of graph - Graph Traversals - Depth-first traversal – breadth-first traversal - applications of graphs - Topological sort – shortest-path algorithms – minimum spanning tree – Prim's and Kruskal's algorithms – Biconnectivity – Euler circuits.

1	**Define graph with example?**			K2
	Graph is a non linear data structure, it contains a set of points known as nodes (or vertices) and set of links known as edges (or Arcs) which connects the vertices. Generally, a graph G is represented as G = (V , E), where V is set of vertices and E is set of edges.	2	5	
2.	What is directed and undirected graph?			K2
	Directed Edge - A directed egde is a unidirectional edge. If there is a directed edge between vertices A and B then edge (A , B) is not equal to edge (B , A).	2		

	 **Undirected Edge** - An undirected egde is a bidirectional edge. If there is a undirected edge between vertices A and B then edge (A , B) is equal to edge (B , A). 			
3.	**What is cycle and circuit of a graph?**			K2
	A path which originates and ends in the same node is called a cycle or circuit.	2		
4.	**What is degree of a graph?**			K2
	The degree of a node is the Number of edges incident to it.	2		
5.	**What do you mean by a strongly connected graph?**			K2
	A Directed graph is strongly connected if there is a path from every vertex to every other vertex.	2		
6.	**What do you mean by weakly connected graph?**			K2
	If the directed graph is not strongly connected, but the underlying graph (without direction to the arcs) is connected, then the graph is said to be weakly connected.	2		
7.	**Define Completed graph.?**			K2
	A graph in which there is an edge between every pair of vertices.	2		
8.	**What are the representations of graph?**			K2
	Adjacency Matrix representation  Adjacency List representation 	2		
9.	**What do you mean by weighted graph?**			K2
	A graph in which there is a number associated with each arc is called as weighted graph.	2		
10.	**Define DFS and BFS?**			K2
	DFS visits all nodes that are reachable from s. BFS visits all the successors of a visited node before visiting any successors of any of those successors.	2		
11.	**What is topological sort?**			K2
	Topological sort is defined as an ordering of vertices in a directed acyclic graph. such that if there is a path from Vito Vj, then Vjappears after Viin the ordering.	2		
12	**Define Spanning Tree?**			K2
	A minimum spanning tree of an undirected graph G is a tree formed from graph edges that connects all the vertices of G at the lowest total cost.	2		
13.	**What is Euler circuit?**			K2
	An Euler path is a path that uses every edge of a graph exactly once.	2		
14.	**What do you mean by articulation point?**			K2
	If a graph is not biconnected, the vertices whose removal would disconnect the graph are known as articulation points.	2		
15.	**Define biconnectivity?**			K2
	A connected graph G is said to be biconnected, if it remains connected after removal of any one vertex and the edges that are incident upon that vertex. A connected graph is biconnected, if it has no articulation points	2		

UNIT V ADVANCED DATA STRUCTURES **9 + 3**

AVL Trees – B-Tree – R-B Tree - Binary Heap - D Heaps – Leftist Heaps – Skew Heaps – Binomial Heap

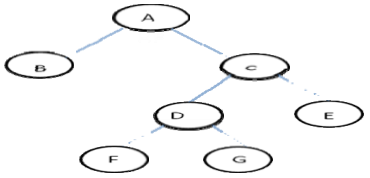
1	**Define AVL Tree?**	2	6	K2
	An AVL tree is a balanced binary search tree. In an AVL tree, balance factor of every node is either -1, 0 or +1.			
2.	**Define Balance factor.**	2		K2
	The balance factor of a node in binary tree is defined to be hR- hL where h Land hRare heights Balance factor = heightOfLeftSubtree - heightOfRightSubtree			
3.	**Mention the four cases to rebalance the AVL tree.**	2		K2
	An insertion of new node into Left subtree of Left child(LL). An insertion of new node into Right subtree of Leftchild(LR). An insertion of new node into Left subtree of Rightchild(RL). An insertion of new node into Right subtree of Right child(RR).			
4.	**Define B-Tree?**	2		K2
	A search tree that is not a binary tree is called B-Tree. That satisfies the following structural properties •Root is either a leaf or has between 2 and M children •All non leaf nodes except the root have between [M/2] and M children. •All leafs are at the same dept			
5.	**List the Operations on B-Trees.?**	2		K2
	• Search • Create • Insert			
6.	**List the B-Trees Applications.?**	2		K2
	• Databases • Concurrent Access to B-Trees			
7.	**Define Splay Tree.?**	2		K2
	A splay treeis a self-balancing binary search tree with the additional property that recently accessed elements are quick to access again. It performs basic operations such as insertion,			
8.	**List the Operations of Splay tree.?**	2		K2
	• Splaying • Insertion • Deleting			
9.	**Define binary heaps?**	2		K2
	A binary heapis a heap data structure created using a binary tree. It can be seen as a binary tree with two additional constraints: shape propertyheap property			
10.	**List the Operations on Binary heap.?**	2		K2
	Adding to the heap •Deleting the root from the heap			
11.	**List the Applications of Binary heap?**	2	7	K2
	• Heap sort • Selection Algorithm • Graph Algorithm			
12.	**What is binary heap?**	2		K2
	A binary heap is a complete binary tree which satisfies the heap ordering property			
13.	**What are the main properties of a binary heap?**	2		K2
	structure property heaporder property			
14.	**R-B Tree?**	2		K2
	red-black tree is a binary search tree which has the following *red-black properties*: **Every node is either red or black.** **Every leaf (NULL) is black.** **If a node is red, then both its children are black.** **Every simple path from a node to a descendant leaf contains the same number of black nodes.**			

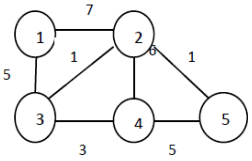
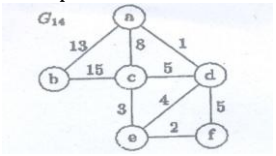
15.	**Define d-heap?**	2		K2
	The d-ary heap or d-heap is a priority queue data structure, a generalization of the binary heap in which the nodes have d children instead of 2.			

Note : 15 Questions with answer key must be prepared in each unit

PART – B (12 Mark Questions with Key)

S.No	Questions	Mark	COs	BTL
UNIT I	**LINEAR DATA STRUCTURES – LIST, STACK AND QUEUE**		**9 + 3**	
Abstract Data Types (ADTs) – List ADT – Array-Based Implementation – Linked List Implementation – Doubly-Linked Lists – Circular Linked Lists – Applications – Cursor-Based Implementation of Linked Lists – Stack ADT: Implementation of Stacks – Applications - Queue ADT: Implementation of Queues – Applications of Queues-Priority Queues.				
1	**Explain array implementation stack with necessary algorithms with example?**	12	1	
	Explanation: Operation [Push, POP] Algorithm for Push, POP Example			K2
2	**Explain in detail the array implementation of queue ADT?**	12		K2
	Explanation of Operation[Front, Rear] Algorithm for Front and Rear Example			
3.	**Write an algorithm to perform the following operation on a singly linked list? i) Adding a node to the front of the list ii) Deleting the first node in the list**	12		K2
	Algorithm for insertion the Beginning Node with example Algorithm for deletion the End Node with example			
4.	**Explain priority queue with example?**	12		K2
	Ascending priority Descending priority Example			
5.	**Explain the linked list Implementation of Stack in details?** Push operation with algorithm Pop operation with algorithm	12		
6.	**Explain how a node at the beginning node is inserted from doubly linked list**	12		K2
	Explanation Algorithm with example			
UNIT II	**HIERARCHICAL DATA STRUCTURES**		**9 + 3**	
Trees: Preliminaries – Implementation of Trees – Tree Traversals with an Application - Binary Trees: Implementation – Expression Trees – Search Tree ADT: Binary Search Trees.				
1	**Explain the various representations of binary tree in detail with suitable examples?**	12	2	
	Array Implementation Linked Implementation			K2
2	**Write the recursive tree tree traversal algorithm for Inorder,Preorder and post order traversals. Apply all the 3 traversal to the following binary tree.**	12		

				
	In order Algorithm Preorder Algorithm Post order Algorithm			K2
3	**Construct a binary search tree by inserting the following data sequentially 45,32,70,67,21,85,92,40 and explain steps involved in detail**	12		K3
	Explanation Algorithm solution			
4.	**Determine how to implement trees and explain?**	12		K3
	Explanation Algorithm			
5.	**Propose the steps involved in constructing an Expression tree and explain with an example?**	12		K2
	Explanation for infix, postfix, prefix Example			
6.	**Illustrate the operations of Binary tree (i)insertion(ii) deletion (iii)searching with algorithms**.	**12**		K3
	Operation for insertion Deletion Searching			
UNIT III	**SORTING AND HASHING**			**9 + 3**
Sorting – Bubble sort - Quick Sort - Insertion Sort – Heap sort – Hashing -Hashing functions - Collision Resolution Techniques - Separate chaining - Open addressing – Multiple hashing.				
1	**Explain the algorithm for Bubble sort and sort the following numbers? 25 73 10 95 68 82 22 60**	**12**		
	Explanation Algorithm solutions			K3
2.	**State and explain the algorithm to perform heap sort with an example?**	**12**		
	Explanation Algorithm with example		3	
3.	**Write down the algorithm for Insertion sort the sequence of number using the algorithm 42 23 74 11 65 57 94 36 99 87 90**	12		
	Explanation Algorithm Solutions			K3
4.	**Construct sorting for the following numbers using Quick sort procedure and Discuss the time complexity and space complexity of this Algorithm. 42, 12, -8, 98, 67, 83, 08, 104, 07**	12		K3

	Explanation Algorithm solutions			
5	**Determine the various Hashing techniques and explain in detail?**	12		
	Separate Chaining with example Open addressing with example		4	
6.	**Determine the various Hashing techniques and explain in detail?**	12		
	Truncation method with example Folding method with example Mid square method with example			
UNIT IV GRAPHS				**9 + 3**
Definitions – Representation of graph - Graph Traversals - Depth-first traversal – breadth-first traversal - applications of graphs - Topological sort – shortest-path algorithms – minimum spanning tree – Prim's and Kruskal's algorithms – Biconnectivity – Euler circuits.				
1	**Explain the BFS with suitable example and also write the BFS algorithm?**	**12**		
	Explanation for BFS Algorithm With solution Example			K2
2	**Explain the DFS with suitable example and also write the DFS algorithm?**	**12**		
	Explanation for BFS Algorithm With solution Example			K2
3.	**Explain in detail about the shortest path algorithm with an example?**	**12**		
	Explanation and Algorithm Example			K2
4.	**Write about Prim's algorithm and explain with suitable example?**	**12**		
	 Explanation Algorithm With solution Example		5	K3
5.	**Propose the Kruskal's algorithm with suitable example in detail?**	**12**		
	Explanation Algorithm With solution Example  			K3
6.	i)**Determine Topological sorting and explain with example.** **ii) Shortnotes on Biconnectivity and Euler circuits**	**12**		
	Topological sorting Biconnectivity Euler circuits			K3
UNIT V ADVANCED DATA STRUCTURES				**9 + 3**
AVL Trees – B-Tree – R-B Tree - Binary Heap - D Heaps – Leftist Heaps – Skew Heaps – Binomial Heap				
1.	**Compose in detail about AVLTree and explain various rotations of AVL Trees**	12	6	K3

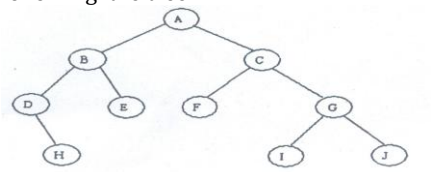
	maintaining balance factor while insertion and deletion takes place			
	LL Rotation, RR Rotation ,LR Rotation, RL Rotation Insertion ,Deletion			
2.	**Describe about B trees in detail.**	12		
	A B-tree of order *m* is an *m*-way tree, all leaves are on the same level all non-leaf nodes except the root have at least $\lceil m / 2 \rceil$ children the root is either a leaf node, or it has from two to *m* children leaf node contains no more than *m* – 1 keys The number *m* should always be odd			
	Insertion for B-Tree Example			
3.	**Explain detail about Binary heap?**			
	Binary Heap • One-array representation of a tree • Complete trees	6		
	Building a Binary Heap • Insert • Delete	6		
4.	**Explain detail about D-Heap?**	12		
	D-Heap Each node has d children Operations on d –Heap	6	7	K2
	Operation ,Insertion and Deletion	6		
5.	**Discuss about skew heaps?**	12		
	Explanation, Operation	7		
	Example	4		
6.	**Construct and explain Binomial Heap?**	12		
	• A binomial tree B_k consists of two B_{k-1} binomial trees that are linked together. The root of one is the leftmost child of the root of the other. • Properties of a binomial tree • Representing Binomial Heaps			
	Binomial-Heap-Minimum Binomial-Heap-Insert Applications			

Note : 6 Questions with answer key must be prepared in each unit and maximum two sub divisions are allowed.

PART – C (20 Mark Questions with Key)

S.No	Questions	Mark	COs	BTL
UNIT I – LINEAR DATA STRUCTURES – LIST, STACK AND QUEUE Abstract Data Types (ADTs) – List ADT – Array-Based Implementation – Linked List Implementation – Doubly-Linked Lists – Circular Linked Lists – Applications – Cursor-Based Implementation of Linked Lists – Stack ADT: Implementation of Stacks – Applications - Queue ADT: Implementation of Queues – Applications of Queues-Priority Queues.				
1	**Explain the linked list Implementation of queue in details?**	20		
	Enqueue operation with Algorithms, Example Dequeue Operation with algorithms Example		1	K2
2	**Explain and Convert the following Infix Expression to postfix using stack. ((A-(**B+C))*D)$(E+F)	20		
	Algorithm solution		1	K2
UNIT II - HIERARCHICAL DATA STRUCTURES				

Trees: Preliminaries – Implementation of Trees – Tree Traversals with an Application – Binary Trees: Implementation – Expression Trees – Search Tree ADT: Binary Search Trees

1	**Find the Expression trees for the following.** 1. (a*b)+(c/d) 2.((a+b)+c)+d) 3. ((-a)+(x+y))/((+b)*(c*a)) 4 .((a*b+c)*d)	20	2	K2
2	Explain the algorithm for preorder, post order, inorder traversal on binary tree traversal following the tree?  	20	2	K2
	Preorder Inorder Post order			

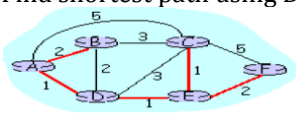
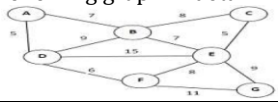
UNIT III - SORTING AND HASHING

Sorting – Bubble sort - Quick Sort - Insertion Sort – Heap sort – Hashing -Hashing functions - Collision Resolution Techniques - Separate chaining - Open addressing – Multiple hashing

1	Write ADT operation for heap sort. also stimulate the following number using heap sort. What is time complexity. 35 45 25 11 6 85 17 38 102 178	20	3	K3
	Algorithm			
	Solution Max =178 102 85 45 38 35 25 17 11 6 Min = 6 11 17 25 35 38 45 85 102 178			
2	**Solve: Given input (18,70,65,51,13)and hash function h(x) =x mod 7 Show the resulting.(i)Separate Chaining.(ii)Closed hashing using Linear probing, quadratic probing, and double hashing h2(x)=7 -(x mod 7).**	20	4	K2
	Separate Chaining Linear probing Quadratic probing Double hashing			

UNIT IV – GRAPHS

Definitions – Representation of graph - Graph Traversals - Depth-first traversal – breadth-first traversal - applications of graphs - Topological sort – shortest-path algorithms – minimum spanning tree – Prim's and Kruskal's algorithms – Biconnectivity – Euler circuits.

1	Find shortest path using Dijkstra's algorithm and explain?  	20	5	K3
	Explanation and algorithm Solution			
2	Illustrate and explain Algorithm to find the minimum spanning tree for the following graph in detail.  	20	5	K3
	Explanation and algorithm Solution			

UNIT V – ADVANCED DATA STRUCTURES

AVL Trees – B-Tree – R-B Tree - Binary Heap - D Heaps – Leftist Heaps – Skew Heaps – Binomial Heap				
1	**Construct an AVL tree for the following numbers. 3,2,1,4,5,6.**	20	6	K2
	Explanation for AVL Tree Algorithm			
2	**Explain detail about i) R-B Tree ii) Binary Heap iii) Skew Heaps iv) D Heaps**	20	7	K2
	i) R-B Tree Operations: insertion, deletion, Search ii) Binary Heap iii) Skew Heaps iv) D Heaps			
Note : 2 Questions with answer key must be prepared in each unit and maximum two sub divisions are allowed.				