Code No: RT21042 **R13** SET - 1

II B. Tech I Semester Supplementary Examinations, June - 2015
DATA STRUCTURES
(Com. to ECE, CSE, EIE, IT, ECC)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1	a)	Differentiate between time complexity and space complexity		3 M
	b)	Give the analysis of Heap Sort Algorithm		4 M
	c)	Describe any one method for representing sparse matrix.		4 M
	d)	What are the advantages of Threaded Binary Tree		4M
	e)	Draw a binary tree with five nodes and three leaves.		3M
	f)	State the situation at which binary search algorithm is best applied.		4 M

PART -B

2	a)	Explain Divide and Conquer algorithmic strategy using Merge Sort as an example.	8 M
	b)	Explain Towers of Hanoi problem with illustrative diagrams.	8 M
3	a)	"Queues can be implemented using two stacks" - Support this statement with suitable programming example.	8 M
	b)	Write an algorithm to convert infix expression into a postfix expression. Illustrate the same with the given infix expression: ((a + b) / d - ((e - f) + g)	8 M
4	a)	Explain how linked list can be used for representing polynomials using a suitable example.	8 M
	b)	Write an algorithm to implement queue using linked list.	8 M
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5	a)	Write a recursive procedure which finds the depth D of a binary tree T.	8 M
	b)	Explain various methods in which a binary tree can be represented. Discuss their advantages and disadvantages.	8 M
6	a)	With the help of diagrams construct a Binary Search Tree (BST) with the following keys: 86, 12, 42, 69, 38, 57, 74, 6, 49, 71. Also delete 42 from the constructed BST.	8 M
	b)	Write a short note on the non-recursive tree traversals using stack.	8 M
7	a)	What are different ways of representing a graph? Explain using suitable example.	8 M
	b)	Define the following terms with respect of a graph: i) Degree of vertex ii) Incident edge iii) Directed edge iv) Path	8 M

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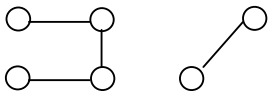
PART –A

1	a)	List out the pros and cons of recursion.		4 M
	b)	Write an algorithm to insert an element into circular queue.		3 M
	c)	What is the running time of Quick sort and why.		4 M
	d)	State how recursion is different from iteration?		3 M
	e)	List out the properties of Binary Search Tree		4 M
	f)	With respect to the graph below (a) Is it cyclic? (b) Is it connected?		4 M



PART -B

2	a)	Define an algorithm. Describe commonly used asymptotic notations and give their significance.		8 M
	b)	Write an algorithm to implement Binary Search technique. Use the algorithm to search 32 in the following list of elements. Explain the process at each step. 12, 16, 17, 19, 20, 22, 24, 29, 30, 32, 37		8 M
3	a)	What is a stack? Explain overheads caused by stack in recursion with a suitable example.		8 M
	b)	Write the algorithm for evaluating a postfix expression using stack. Evaluate the following postfix notation 5 6 2 + * 8 4 / -		8 M
4	a)	What is linked list? Write an algorithm for inserting an element E at the given position P of the linked list.		8 M
	b)	What is a sparse matrix? Write an algorithm for finding the transpose of a sparse matrix.		8 M
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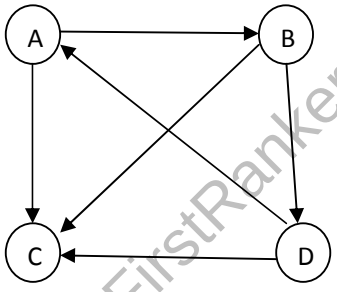
5	a)	What is a binary tree? Construct a binary tree given the pre-order traversal and in-order traversals as follows: Pre-Order Traversal: G B Q A C K F P D E R H In-Order Traversal: QB K C F A G P E D H R	8 M
	b)	Define the following terms with suitable examples i. Binary Tree ii. Strictly Binary Tree iii. Complete Binary Tree iv. Almost Complete Binary Tree	8 M
6	a)	Write a procedure to search an element in a Binary Search Tree.	8 M
	b)	Write a short note on various operations of the threaded binary tree.	8 M
7	a)	Write an algorithm to traverse the graph using Breadth First Search with a suitable example?	8 M
	b)	What is Adjacency Matrix? Draw the Adjacency Matrix of the following graph. Also give adjacency list representation for the same.	8 M



Code No: RT21042 **R13** SET - 3

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2. Answer **ALL** the question in **Part-A**
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PART –A

1	a)	What is an algorithm? List out the properties of an algorithm.	4 M
	b)	Differentiate POP with PEEP operation of a stack.	3 M
	c)	List out the advantages and disadvantages of using linked list over an array	4 M
	d)	Write an algorithm to count the number of nodes in a circularly linked list.	4 M
	e)	Draw the BST for the given list of elements 46, 21, 56, 89, 9, 12.	4 M
	f)	Draw an undirected graph from the given adjacency matrix.	3 M

$$\begin{bmatrix} 1 & 0 & 1 \\ 1 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

PART -B

2	a)	Write a recursive function to find factorial of a given number.	8 M
	b)	Explain radix sort with an algorithm. Discuss on its time complexity.	8 M
3	a)	List out the applications of stack. Consider the usual algorithm for determining whether a sequence of parentheses is balanced. What is the maximum number of parentheses that will appear on the stack AT ANY ONE TIME when the algorithm analyzes: (( ) (( )) (( )))?	8 M
	b)	Explain various operations that are performed on queue with suitable algorithms.	8 M
4	a)	Write algorithms for swapping two successive elements in a singly linked list with the first element placed at position P.	8 M
	b)	What is a circular linked list? Write an algorithm to merge two circular linked lists.	8 M
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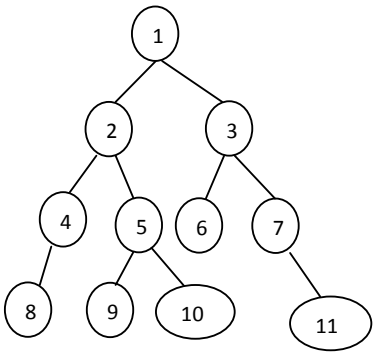
5 a) Consider the following tree. 8 M



i. How many leaves does it have?
ii. How many of the nodes have at least one sibling?
iii. List out the nodes that are siblings to node 5?
iv. How many descendants does the root have?
v. What is the depth of the tree?
vi. How many children does the root have?
vii. "Is it a complete binary tree" - Justify

b) Write the iterative procedures for 8 M
i. Post-Order Traversal of a binary tree
ii. Level-Order Traversal of a binary tree

6 a) Define threaded binary tree. Explain inorder threading using suitable example. Discuss advantages of the threaded binary tree. 8 M

b) Write a procedure to find the maximum and minimum elements of a Binary Search Tree (BST). 8 M

7 a) Write the Prim's algorithm for finding the minimum-spanning tree of a graph with an example. 8 M

b) What is transitive closure of a graph. Explain Warshall's algorithm to find the transitive closure of the graph with a suitable example 8 M

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2. Answer **ALL** the question in **Part-A**
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PART –A

1	a)	List out some examples for linear and non-linear data structures.	3 M
	b)	Write the differences between stack and queue.	3 M
	c)	What is singly linked list? Mention any two advantages of singly linked lists.	4 M
	d)	State the scenario under which insertion sort should be used.	4 M
	e)	Define threaded binary tree with an example.	4 M
	f)	Does the minimal spanning tree of a graph give the shortest distance between any two specified nodes? Justify your answer.	4 M

PART -B

2	a)	Arrange the list of elements in ascending order using quick sort 45, 26, 31, 55, 77, 24, 42, 63, 99, 22, 88, 72 ? Write the value of left pointer l, right pointer r and pivot at each step and also draw the current scenario after each step?	8 M
	b)	Write a recursive procedure to compute the n^{th} Fibonacci number.	8 M
3	a)	"One of the applications of stack is **Reversing a List**" Explain it with a suitable algorithm.	8 M
	b)	List out various applications of queues. Explain how queue is used in Round Robin Algorithm with neat diagrams wherever necessary?	8 M
4	a)	Discuss the advantages and disadvantages of representing a group of items as an array versus a linear linked list.	8 M
	b)	Write an algorithm to insert a node at the end of a doubly linked list.	8 M
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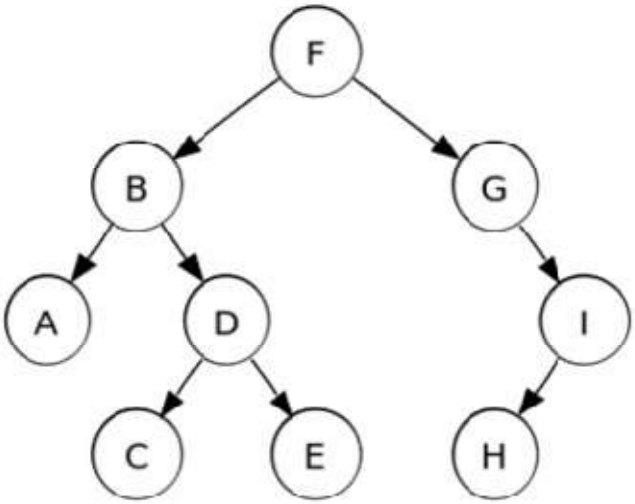
5 a) Find the inorder, preorder and postorder traversals for the given binary tree. 8 M



b) Write a procedure to display the nodes of a binary tree at a particular level. 8 M

6 a) Give the analysis of insertion and deletion operations of nodes in binary search tree. 10 M

b) Write a short note on Balanced Binary Trees. Also discuss on the applications of Balanced Binary Trees. 6 M

7 a) Differentiate between the DFS and BFS graph traversal techniques. 8 M

b) What are connected components of a graph? Is there a method to find out all the connected components of a graph? Explain. 8 M