Code No: R21051 $\boxed{\text{R10}}$ $\boxed{\text{SET - 1}}$

II B. Tech I Semester Supplementary Examinations, September - 2014
DATA STRUCTURES
(Com. to CSE, IT, ECC)

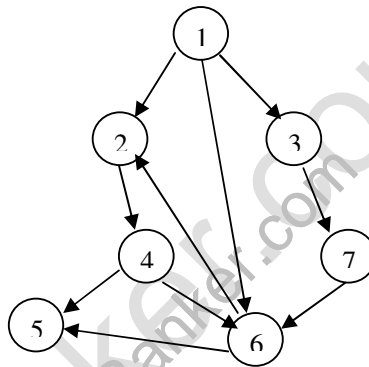Time: 3 hours   Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) What are the various ways of finding the complexity of an algorithm? Explain with suitable examples.

    b) What is recursion? Write a recursive function for finding Fibonacci sequence of 8 terms.

                                                                    (8M+7M)

2. a) Arrange the following list of elements in ascending order using Heap Sort.

    9, 3, 5, 27, 4, 67, 18, 31, 13, 20, 39, 21

    Clearly show the sorting process at each step.

    b) Write an algorithm to implement bubble sort and explain how the worst case complexity of bubble sort is $O(n^2)$.   (8M+7M)

3. a) Convert the following infix expression into its corresponding postfix expression with proper explanation at each step.

    (a + b * c / d) + (e + f $ g)

    b) Explain the operations of queue with suitable algorithms and examples.   (8M+7M)

4. a) Write an algorithm for reversing the single linked list and explain it with suitable example.

    b) How can you identify the end of the circular linked list? Write an algorithm to identify the number of elements in the circular linked list.   (8M+7M)

5. a) The inorder and preorder sequence of a binary tree are given. Draw the resultant binary tree and also write its post order sequence.

    Preorder: A B D G H E I C F J K

    Inorder: G D H B E I A C J F K

    b) Write any 5 applications of binary trees.   (10M+5M)

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6. a) Sketch the binary search tree resulting after inserting the following integer keys 49, 27, 12, 11, 33, 77, 26, 56, 23, 6

     i) Check whether the tree is almost complete or not?

     ii) Determine the height of the tree

     iii) Write post order and preorder traversals.

   b) Explain the operations of threaded binary tree.   (10M+5M)

7. a) How many Minimum spanning trees can be formed from a given graph? Explain the process of finding the minimum spanning tree with suitable example.

   b) Find BFS and DFS for the following graph   (5M+10M)

8. a) What is ADT? Write ADT implementation for stack.

   b) Explain various operations of sets using linked lists.   (8M+7M)

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1. a) What is an algorithm? Discuss its advantages and disadvantages. Write an algorithm for

    i) Preparing the coffee

    ii) Linear search

    b) Distinguish between recursive function and iterative function.

    Determine what the following recursive C function computes:

    int function(int n)

    {

       if(n == 0)

          return(0);

       return(n+function(n-1);

    }

    Write the corresponding iterative function to accomplish the same.   (8M+7M)

2. a) Arrange the following list of elements in ascending order using Quick sort

    Q, U, I, C, K, S, O, R, T, I, N, G

    Clearly show the sorting process at each step.

    b) Differentiate between External Sort and Internal Sort with suitable examples   (8M+7M)

3. a) Write down the steps required to evaluate the following postfix expression

    4 2 $ 3 * 3 – 8 4 / 1 1 + / +

    b) What is priority queue? Write an algorithm to insert an element into a priority queue using

    arrays.   (8M+7M)

4. a) List out any two applications of linked lists and also give advantages and disadvantages of
       doubly linked lists over singly linked list.

    b) Write an algorithm to merge two sorted singly linked lists into a single sorted list.

                                                                                         (5M+10M)

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5. a) Explain how a binary tree is different from tree? Also write short note on representation of binary trees.

   b) Construct the binary tree from the given inorder and postorder traversals. Also find the preorder sequence for the constructed binary tree.
   Postorder: 10 20 30 60 80 90 40
   Inorder: 10 20 30 40 60 80 90   (5M+10M)

6. a) Write an iterative function to search for a key value in Binary search tree.

   b) Write an algorithm for constructing binary tree for the given expression and also construct a binary tree for the expression ((6 + (3 – 2) * 5) ^ 2 + 3)   (8M+7M)

7. a) Consider the following graph and find its
   i) Adjacency List   ii) Adjacency Matrix
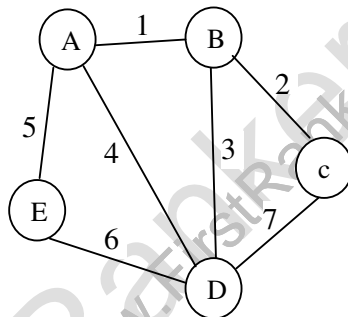
   b) Explain Dijkstra's algorithm for shortest path problem with suitable example.   (5M+10M)

8. a) What is ADT? Write ADT implementation for queue.

   b) Explain the concept of information storage using bit strings with suitable examples.

          (8M+7M)

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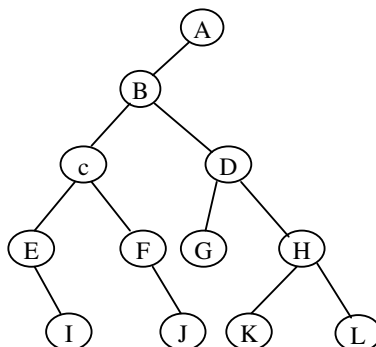Time: 3 hours   Max. Marks: 75

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1. a) Explain recursion with suitable example. Discuss advantages and disadvantages of recursion.
    b) Write a recursive algorithm to search an element using binary search. Use this algorithm to find the element 9 in the list 1, 4, 7, 9, 23, 34, 45, 51, 67, 72, 99. Clearly show the tracing of the algorithm.   (5M+10M)

2. a) Explain how selection sort differs from insertion sort with suitable examples.
    b) Arrange the following list of elements in ascending order using Radix Sort
       4, 53, 12, 23, 9, 54, 36, 21, 87, 61, 10, 32
       Clearly show the sorting process at each step.   (5M+10M)

3. a) Write a short note on stack. Give the pseudo code for implementing various stack operations.
    b) What do you mean by circular queues? Give the array implementation of it. Write down the algorithms for implementing insertion and deletion of elements from the circular queue.
                                                                              (5M+10M)

4. a) "Queues can be implemented using singly linked list" Support the above statement with suitable algorithms.
    b) Write an algorithm for representing the polynomial $6x^6 + 4x^3 - 2x + 10$ using linked lists. Also discuss the advantages and disadvantages of linked lists over an array.   (8M+7M)

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5. a) Define the following terms with reference to general trees with suitable diagram:
   Father, Son, Sibling, Forest, Depth and ordered tree
   b) Define strictly binary tree and check whether the following tree is strictly binary tree or not
   with proper explanation.   (10M+5M)

6. a) Write short note on the following with neat sketches and examples
   i) Threaded Binary tree
   ii) Expression tree
   b) Write short note on AVL trees and also give an example for inserting an element into AVL
   trees.   (8M+7M)

7. a) What is a graph? How is it different from Tree? Write a short note on linked list
   representation of the graph.
   b) Explain how Prim's algorithm is used for finding the minimum spanning tree of a graph.
          (5M+10M)

8. a) Explain the concept of representing sets using linked lists with suitable example.
   b) What is Abstraction? Is abstraction really needed in data structures? If so explain?
          (8M+7M)

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1. a) Write a recursive function fact(n) to find the factorial of an integer. Diagrammatically explain how elements are stacked and unstacked during execution of fact(4).
   b) Write short notes on
      i) Tail recursion   ii) Fibonacci Search   (8M+7M)

2. a) "Selecting the pivot element plays vital role in Quick sort" support this statement with proper explanation. Explain various choices available for selecting the pivot.
   b) Arrange the following list of elements in ascending order using Merge Sort
      A, L, G, O, R, I, T, H, M, S
      Clearly show the sorting process at each step.   (5M+10M)

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: ( ) (( )) (( )))?
   b) Explain how circular queues are different from ordinary queues with suitable examples.
                                                                   (10M+5M)

4. a) Explain the structure for different types of linked lists. Write an algorithm to count the number of elements in the singly linked list.
   b) Write algorithms for the following
      i) Inserting an element at the start of the Double – Linked – List.
      ii) Deleting an element from the middle of the Double – Linked – List.   (5M+10M)

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5. a) Write recursive algorithms for the following tree traversals

    i) Preorder   ii) Postorder   iii) Inorder

    b) With reference to the tree given below answer the following.

    i) Is it a binary tree?   ii) Is it a complete tree?

    iii) Give the preorder traversal.   iv) Give the inorder traversal

    v) Give the postorder traversal   vi) Is it a max heap?

    vii) What is the depth of the tree?   (8M+7M)

```
              9
            /   \
           8     7
          / \     \
         6   5     4
```
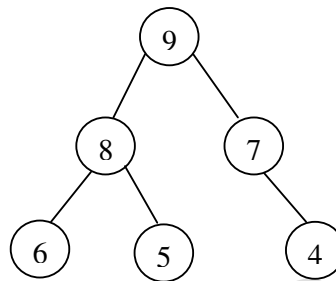
6. a) Explain how double rotation fix the problem found in the single rotation of AVL tree with an example.

    b) Write non recursive algorithms for the following tree traversals

    i) Inorder   ii) Postorder   (8M+7M)

7. a) Write a short note on transitive closure. Explain Warshall's algorithm to find the transitive closure of the graph.

    b) Differentiate directed graph with undirected graph with suitable examples. Write a short note on adjacency matrix representation of the graph.   (10M+5M)

8. a) What is Abstraction? Is abstraction really needed in data structures? If so explain why?

    b) What is ADT? Write ADT implementation for queue.   (7M+8M)