



## P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

**Third Semester, B.E. - Computer Science and Engineering**

**Semester End Examination; Dec - 2016/Jan - 2017**

### Data Structures

Time: 3 hrs

Max. Marks: 100

*Note: Answer FIVE full questions, selecting ONE full question from each unit.*

#### UNIT - I

- 1 a. Why we need to convert infix to postfix or prefix notations? Change the infix expression given below to postfix notation. Show each step clearly, 4
- i)  $(A + B) * (C - D) * F + C$                       ii)  $(A - 2 * (B + C) - D * E) * F.$
- b. Write a program to evaluate the postfix expression. 12
- c. Write ADT for rational numbers. 4
- 2 a. Write recursive program for Tower of Hanoi problem. Trace the program by taking two disks. 8
- b. Write a program to convert prefix to postfix expression. 12

#### UNIT - II

- 3 a. Write an algorithm to perform the following operations : 8
- i) To append two circular singly linked list
- ii) To find greatest number in singly linked list.
- b. Write an algorithm to perform the following on DLL : 12
- i) To reverse given sting
- ii) To find frequency of a given integer
- iii) To generate a list called prime (List containing only prime numbers) from the main list.
- 4 a. Write a program using SLL to reverse the given list of integer number without creating another list. 8
- b. Write an algorithm to delete and insert a node at a given position with header node using DLL. 8
- c. Differentiate between array and linked list. 4

#### UNIT - III

- 5 a. Write a program to add two polynomials. 12
- b. Consider a node with following information: id, name, address and blood group. Write a program to create a list and display the all names and address of persons whose blood group is specified at runtime using SLL. 8

- 6 a. Write a program to group the given list of numbers while maintaining their original order. Use queues to implement the same.
- Group1: 1 – 10  
 Group 2 : 11 – 20  
 Group 3 : 30 – 40  
 Group 4 : Greater than 40 12
- Example: if input is : 79, 46, 12, 48, 3, 14, 32, 11, 2, 10  
 output : group 1 – 3, 2, 10  
           group 2 – 12, 14, 11  
           group 3 – 32  
           group 4 – 79, 46, 48
- b. List and explain basic queue operations with example. 4
- c. Write an algorithm to insert an element into a queue. 4

#### UNIT - IV

- 7 a. Define the following with example, 6
- i) Binary tree      ii) Height of a tree      iii) Complete binary tree      iv) Balance factor.
- b. Draw all possible binary search trees for the data elements 5, 9 and 12. 4
- c. Write an algorithm for the following operations on binary search tree, 10
- i) Delete an element from BST
- ii) To find smallest node.
- 8 a. Draw expression tree and find prefix and postfix expression for the following infix expression,  $(C + D + A * B) * (E + F)$ . 6
- b. Write an algorithm to insert an element into threaded binary tree. 8
- c. List and explain the properties of binary tree and also give the operations that can be performed on binary tree with an example. 6

#### UNIT - V

- 9 a. Write a program to sort the elements using merge sort method. 10
- b. Given a list of number, sort them using quick sort. Show the steps clearly, 10  
 List : 45, 78, 93, 46, 74, 2, 15, 8.
- 10 a. Write a program to search for the given data using probability search. 10
- b. Write a program to search whether the given name is present in the list of 'N' names using binary search method. 10