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**P.E.S. College of Engineering, Mandya - 571 401**  
*(An Autonomous Institution affiliated to VTU, Belgaum)*  
**Third Semester, B.E. – Information Science and Engineering**  
**Semester End Examination; Dec. – 2014**  
**Data Structures**

Time: 3 hrs

Max. Marks: 100

*Note : i) Answer FIVE full questions, selecting ONE full question from each Unit.  
 ii) Assume suitable missing data if any..*

**Unit - I**

- 1 a. What is Recursion? Write a recursive program to solve tower of Hanoi problem. 6
- b. Obtain the postfix and prefix expression for  $\left(\left(\left(A + (B - C) * D\right)^E\right) + F\right)$  4
- c. Write an algorithm to evaluate postfix expression and apply the same for the postfix expression  $ABC - D * + E \$ F +$  and assume  $A = 6, B = 3, C = 2, D = 5, E = 1, F = 7$  and give the tracing along with stack contents. 10
- 2 a. Write a C program to implement stacks using arrays with push ( ), pop ( ), and display ( ) operation. 10
- b. Write a C program to implement two stacks in a single array. [Hint: Two stacks grow towards each other]. 10

**Unit - II**

- 3 a. What are the advantages and disadvantages of linked list over an array? 5
- b. Give the node structure to create a linked list of integers and write a C function to perform the following: 10
- i) Create a 3 node list with data 10, 20, 30
- ii) Insert a node with data value 15 in between the nodes having data values 10 & 20.
- iii) Delete a node which is followed by a node whose data value is 20.
- iv) Display the result using circular doubly linked list.
- c. Write C function to concatenate 2 lists into a single list. 5
- 4 a. Using circular representation write a C program to add 2 polynomial and print the resultant polynomial. 10
- b. Using singly linked list write a C function to 10
- i) Reverse a given list                      ii) Create an ordered linked list.

**Unit - III**

- 5 a. What is disadvantage of ordinary queue? Write a C program to implement circular queue using arrays with the operation insert, delete and display. 10

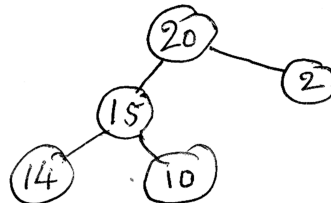
- b. Write a C function to change the info field of the K<sup>th</sup> node to the value given by X. 10
- 6 a. Write a program to implement queue using circular doubly linked list. 10
- b. Explain different types of priority Queues and its application. 5
- c. Enlist the advantages and disadvantages of doubly linked list over singly linked list. 5

**Unit - IV**

- 7 a. Define binary search tree and construct binary search tree with elements {22, 28, 20, 25, 15, 18, 10, 14}. Give recursive search algorithm to search for an element in the tree. 10
- b. Write an expression tree for the following postfix expression ab+cd-\*ef+/. and write inorder, preorder, postorder traversal for the same. 10
- 8 a. Write a C function to find the inorder successor of a node in a threaded binary tree. 10
- b. Explain; (i) Threaded binary tree (ii) Strictly binary tree (iii) Complete binary tree. 6
- c. Write a function to find the maximum element in a binary search tree. 4

**Unit - V**

- 9 a. Write a C program to sort a list of integers using merge sort. 10
- b. Write the insertion sort algorithm. Give tracing for the elements 25,57,48,37,12,92,86,33. 10
- 10 a. What is heap? Explain clearly the different types of heaps? Indicate the steps to insert an element 21 for the heap shown in Fig given below. 10



- b. Explain sentinel search and order list search. 10

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