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**Third Semester B.E. Degree Examination, June/July 2013**  
**Data Structure with C**

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting  
atleast TWO questions from each part.**

**PART – A**

1.
  - a. Define pointer. With examples, explain pointer declaration, pointer initialization and use of the pointer in allocating a block of memory dynamically. (06 Marks)
  - b. Define recursion. Give two conditions to be followed for successive working of recursive program. Given recursive implementation of binary's search with proper comments. (06 Marks)
  - c. Define three asymptotic notations and give the asymptotic representation of function  $3n + 2$  in all the three notations and prove the same from first principle method. (08 Marks)
  
2.
  - a. What is a structure? Give three different ways of defining structure and declaring variables and method of accessing members of structures using a student structure with roll number, name and marks in 3 subjects as members of that structure as example. (06 Marks)
  - b. Give ADT sparse matrix and show with a suitable example sparse matrix representation storing as triples. Give simple transpose function to transpose sparse matrix and give its complexity. (08 Marks)
  - c. How would you represent two sparse polynomials using array of structure and also write a function to add that polynomials and store the result in the same array. (06 Marks)
  
3.
  - a. Give ADT stack and with necessary function, explain implementing stacks to hold records with different type of fields in stack. (06 Marks)
  - b. Give the disadvantage of ordinary queue and how it is solved in circular queue. Explain the same. Explain with suitable example how would you implement circular queue using dynamically allocated arrays. (08 Marks)
  - c. Convert the infix expression  $a/b - c + d * e - a * c$  into postfix expression. Write a function to evaluate that postfix expression and trace that for given data  $a=6, b=3, c=1, d=2, e=4$ . (06 Marks)
  
4.
  - a. Give the mode structure to create a linked list of integers and write C functions to perform the following :
    - i) Create a three –node list with data 10, 20 and 30
    - ii) Inert a node with data value 15 in between the nodes having data values 10 and 20
    - iii) Delete the node which is followed by a node whose data value is 20
    - iv) Display the resulting singly linked list. (08 Marks)
  - b. With node structure show how would you store the polynomials in linked lists? Write C function for adding two polynomials represented as circular lists. (06 Marks)
  - c. Write a note on :
    - i) Linked representation of sparse matrix
    - ii) Doubly linked list. (06 Marks)

## PART – B

- 5 a. Define a binary tree and with example show array representation and linked presentation of binary tree. (06 Marks)
- b. Write an expression tree for an expression  $A/B + C * D + E$ . Give the algorithm for inorder, postorder and preorder traversals and apply that traversal method to the expression tree and give the result of transversals. (08 Marks)
- c. Define a Max Heap. Explain clearly inserting an element that has value 21 for the heap shown in Fig. Q5(c), given below and show the resulting heap. (06 Marks)

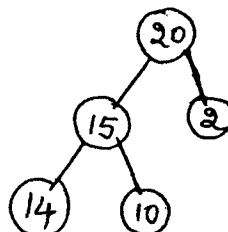


Fig. Q5(c)

- 6 a. Define a binary search tree and construct a binary search tree. With elements {22, 28, 20, 25, 22, 15, 18 10, 14}. Give recursive search algorithm to search an element in that tree. (06 Marks)
- b. What is a winner tree? Explain with suitable example a winner tree for  $k = 8$ . (06 Marks)
- c. Construct a binary tree having the following sequences.  
 i) Preorder sequence : ABCDEFGHI  
 ii) Inorder sequence : BCAEDGHI  
 Show the steps if constructing binary tree in the above example. (03 Marks)
- d. Give the adjacency matrix and adjacency lists representation for the graph shown in Fig. Q6(d). (05 Marks)

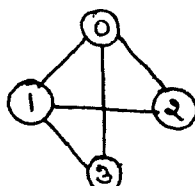


Fig. Q6(d)

- 7 a. Define the following :  
 i) Single ended priority queues  
 ii) Double ended priority queues  
 iii) Height –based leftist trees  
 iv) Weight – based leftist trees  
 v) A binomial tree  
 vi) Extended binary tree. (06 Marks)
- b. With suitable example, explain leftist trees and give structure of nodes. (06 Marks)
- c. What is Fibonacci heap? Give suitable example and give the steps for deletion of node and decrease key of specified node in F – heap. (08 Marks)
- 8 a. What is an AVL tree? Stating with an empty AVL tree perform the following sequence of insertions, MARCH, MAY NOVEMBER, AUGUST, APRIL, JANUARY, DECEMBER, JULY, FEBRUARY, DRAW the AVL tree following each insertion and state rotation type if any for any insert operation. (10 Marks)
- b. Define RED – BLACK trees and give its additional properties starting with an empty red-black tree insert the following keys in the given order {50, 10, 80, 90, 70, 60, 65, 62}, giving color changing and rotation instances. (10 Marks)

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