

**B: Tech.**  
**Third Semester Examination, 2013-14**  
**Data Structure using C**

**Time: 3 Hours**

**Total Marks: 100**

**Note: Attempt all questions. All question carry equal marks.**

**Q.1- Attempt any four parts of the following:**

**(5x4=20)**

- a) Write an interactive program in C which transposes the given 3x3 matrix.
- b) Write an efficient algorithm to find the  $k^{\text{th}}$  element in a sequence of  $n$  elements.
- c) Determine the formula to find the address location of an element in three-dimensional array. Let each element takes four bytes of space and elements are stored in row major order.
- d) How a polynomial equation can be represented through link list? Explain the method to add two given polynomial equations using link list.
- e) Write an algorithm and a C function to reverse a single link list.
- f) Define the double link list. Write an algorithm to delete an element from the existing link list.

**Q.2- Attempt any four parts of the following:**

**(5x4=20)**

- a) Write an algorithm to evaluate the given In-Fix expression in post-fix notation.  
 $B * (A + D) / F - E (H + K * G)$
- b) Write deletion algorithm for a stack. What is its complexity?
- c) Explain the quick sort method. Sort the following sequence into increasing order using quick sort method, also show the steps used in sorting.
- d) How can you reverse a string using stack? Give one example and show how you can reverse a given string using stack.
- e) Evaluate the given post fix expression. Assume  $A=3, B=2, C=1$   
 $ABD + C * DAB - + * +$
- f) What is asymptotic notation? Explain the bog 'O' notation.

**Q.3 Attempt any two parts of the following:**

**(10x2=20)**

- a) Prove that a strictly binary tree with  $n$  leaves contains  $2n-1$  nodes.
- b) Define the binary and the complete binary tree with example. Consider following in-order and pre-order traversal of binary tree:  
Pre-order:  $E, B, F, K, C, H, D, G, A$   
In-order:  $F, B, K, C, E, H, D, G, A$
- c) Write notes on:
  - (i) Height balance tree;
  - (ii) Threaded binary tree;

Q.4- Attempt any two parts of the following:

(10x2=20)

- Define the B-tree. Explain the steps to build a B-tree of order 5 on the following sequence of input: 65, 21, 13, 10, 96, 84, 73, 62, 44, 41, 56, 19, 15, 18, 31, 28, 30
- How you can find shortest path between two nodes in a graph by Dijkstra's algorithm? Explain by using suitable diagram and algorithm.
- Write and explain the breadth first search and depth first search (graph traversal) algorithm. What are their complexities?

Q.5 Attempt any two parts of the following:

(10x2=20)

- What is AVL tree? Explain the method to balance any AVL trees with a example.
- Write and explain radix sort algorithm for a given set of n strings where the largest number of characters in a strings is K
- Write Kruskal's algorithm to find the minimum spanning tree. Find the minimum spanning tree using Prim's algorithm for a given graph

