ROLL NO. _____

Code: CT11 **Subject: DATA STRUCTURE THROUGH 'C'**

ALCCS

Time: 3 Hours **June 2017** **Max. Marks: 100**

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE:

- **Question 1 is compulsory and carries 28 marks. Answer any FOUR questions from the rest. Marks are indicated against each question.**
- **Parts of a question should be answered at the same place.**

Q.1 a. Define two dimensional array in terms of one dimensional array. What is the advantage of using array data structure?

b. What do you mean by recursion? Write a recursive function for finding factorial of a positive integer n.

c. Define an AVL tree. What are the various techniques for balancing an unbalanced AVL tree?

d. Why do we need postfix form of an arithmetic expression? Give an example.

e. If records are of length n. In merge-sort algorithm, show that merge time is independent of n.

f. What do you mean by tree traversal? Write a function to traverse a binary search tree in preorder.

g. Show that the total number of comparisons in selection sort is $O(n^2)$ where n is the number of elements to be sorted. **(7×4)**

Q.2 a. What is the relationship between arrays and pointers in C? Explain it upto 2D arrays. **(9)**

b. Obtain the addressing formula for (i, j)th element of an array A[m][n]. Assume a row major representation with one word per element and α the address of A[o][o]. **(9)**

Q.3 a. Give the representation of a polynomial as a circular linked list. Write a function in C to add two polynomials. **(10)**

b. Write a function in C to concatenate two linked lists. **(8)**

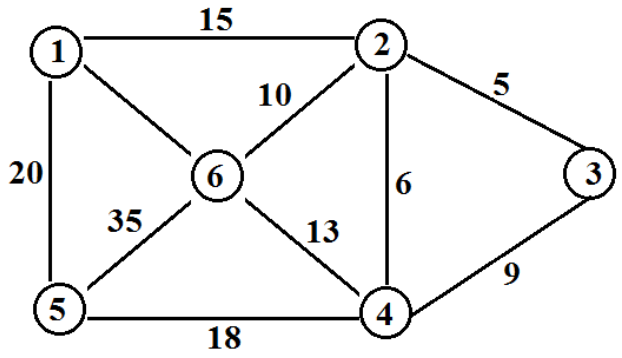
Q.4 a. Give an implementation of a stack using linked list, giving push and pop operations. **(9)**

b. Write an algorithm to convert infix expression to postfix, using stack. **(9)**

Q.5 a. Create a heap of size 8 from the data 25, 57, 48, 37, 12, 92, 86, 33. Adjust the heap so that the elements are sorted. **(9)**

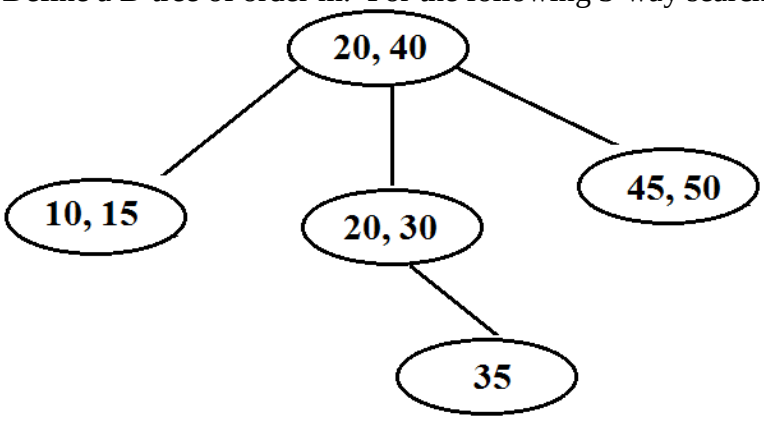
b. Write a function in C language to delete a node from a binary search tree pointed by the pointer p. Assume that left (p), right(p) and node(p) holds the left, right pointers of the binary search tree and record itself respectively. **(9)**

Q.6 a. Find the minimum cost spanning tree for the following graph **(9)**



b. Write the steps or pseudocode for finding shortest path from a source vertex S_o to all vertices of a graph. **(9)**

Q.7 a. Define a B-tree of order m. For the following 3-way search tree give the B-tree. **(9)**



b. Construct B^+ tree for the data items 1, 4, 7, 10, 17, 21, 31, 25, 19, 20, 28 with each node having 3 data items. **(9)**