## ALCCS - NEW SCHEME

**Code: CT11**                                          **Subject: DATA STRUCTURE THROUGH C**
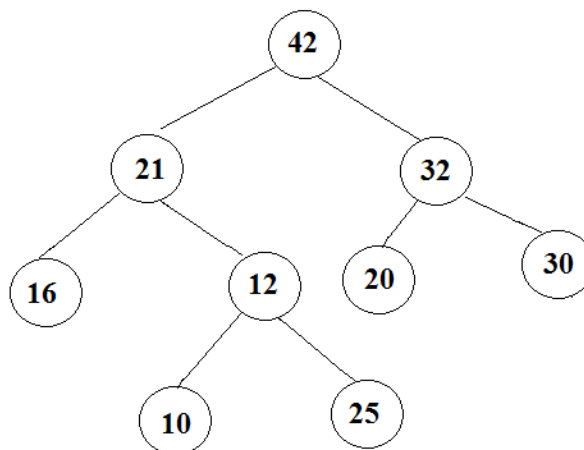**Time: 3 Hours**                                                      **Max. Marks: 100**

**AUGUST 2011**

**NOTE:**
- **Please write your Roll No. at the space provided on each page immediately after receiving the Question Paper.**
- **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**                                                                          **(7 × 4)**

   a. State the advantages and disadvantages of using a singly linked list and a doubly linked list.

   b. Write a C function that will return the number of nodes in a circular linked list.

   c. Explain the Eight Queens problem.

   d. Consider the following statement
     int J,K,p;
     float q, r, a;
     a = J/K;
     p = q/r;
     If q = 7.2, r = 2, J = 3, K = 2, find the value of a and p.

   e. Is the following binary tree a heap? Give reasons for your answer.



   f. Write the worst and average asymptotic complexity of heap sort and Quick sort algorithms.

g. Define a B-tree of order *m*. Give an example of a B-tree of order 2.

**Q.2**  a. Assume that the contents of queue Q1 and queue Q2 with front (left) to rear (right) are shown as below:

    Q1: 42  30  41  50
    Q2: 1    4   13

What would be the contents of Q1 and Q2 at the end of each of the iteration of the "while" loop, once the following pseudo code containing five statements is executed?

    1        while ( (not empty Q1) and (not empty Q2) ) do
    2            x = delqueue( Q1 )
    3            x = delqueue( Q2 )
    4            addqueue( Q1, x )
    5        end while

In the above pseudo code it is assumed that the functions
        delqueue( Q ) returns the output of the deleted element from the queue Q;
        addqueue( Q, x ) performs adding the value of the variable x in the queue Q.

**(6)**

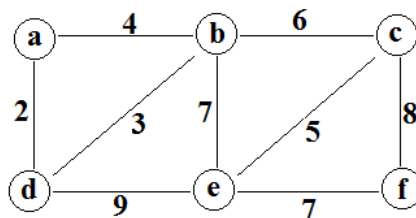b. Write a C function program to delete the last node of a singly linked list.  **(6)**

c. Write a C program to calculate the average of a set of n numbers.  **(6)**

**Q.3**  a. Write an algorithm to evaluate a postfix expression given as a string of characters using stack.  **(10)**

b. Using the algorithm evaluate the postfix expression given below, explaining the intermediate steps and also finding the contents of the stack.  **(8)**
    7 2 3 + - 2 /

**Q.4**  a. Let G be an undirected connected graph given by



Using Kruskal's algorithm, generate a minimum cost spanning tree and find its cost.  **(9)**

b. Write a recursive C function programme for inorder binary tree traversal algorithm.  **(9)**

**Q.5**  a. Construct binary search tree for the following data entered in sequence given as:
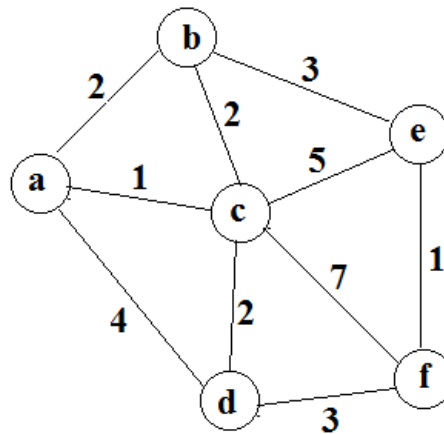    70   80   60   65   50   45   55  **(7)**

b. Is the binary search tree constructed in Q5a an AVL tree? State reasons for your claim. Further, if your answer is negative, balance the tree so that it becomes an AVL tree. **(7)**

c. Draw the linked list representation of the polynomial $p(x)$ given by

$$p(x) = \frac{2}{3}x^5 - x^3 + 3x - 2$$  **(4)**

**Q.6**   a. With an example, explain the working of Quick sort algorithm.  **(10)**

b. Find the shortest path using Dijkstra's algorithm for the following weighted graph from node $a$ to node $e$. Explain the steps.  **(8)**



**Q.7**   Write short note on any **THREE** of the following:

(i)   Threaded binary tree
(ii)  Game tree
(iii) Radix sort
(iv) B+ tree
(v)  Boundary tag method  **(3×6)**