D 20625   (Pages : 3)   Name...

Reg. No.....................................

THIRD SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION OCTOBER 2011

CS/IT 09 303/PTCS 09 302—DATA STRUCTURES

(2009 Admissions)

Time : Three Hours   Maximum : 70 Marks

Part A

Answer all *questions.*
Each question carries 2 marks.

A.   1   What are the differences between linear and non-linear data structures.

     2   What is time complexity to delete a node in singly linked list.

     3   Define Minimum spanning tree.

     4   Find the time complexity of binary search.

     5   Worst case, what is time complexity of quick sort.

$(5 \times 2 = 10 \text{ marks})$

Part B

Answer any four *questions.*
Each question carries 5 marks.

B.   1   A recursive function f is shown below. What is the value of $f(5)$?

```
int f (int x)
{   if (x < 2)
      return 1;
   else

   return f(x – 1) + f(x – 2).
```

     2   Convert following infix expression into postfix expression and prefix expression.

$(A - B) * C + D / (E - G).$

     3   Write down the algorithm for deletion operation performed on the circular queue.

     4   A Binary tree T has 9 nodes. The in-order and pre-order traversals yield the following sequence of nodes :—
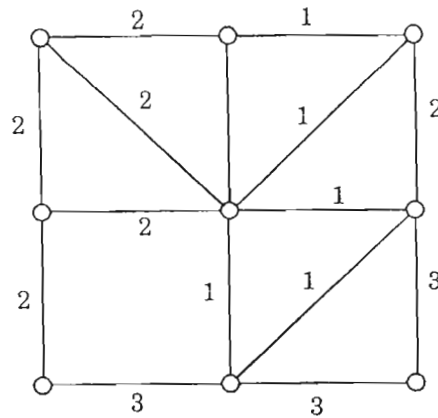
        in-order   : E A C K F H D B G

        pre-order : F A E K C D H G B
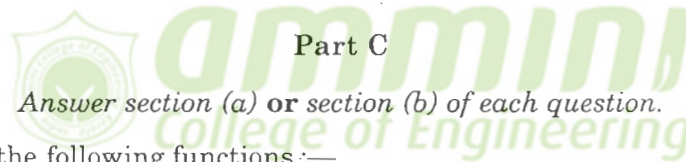
    Draw Binary Tree.

Turn over

5   Find minimum spanning tree of the following graph through KRUSKAL'S algorithm

6   The following values are to be stored in a Hash-table :—

  25, 42, 96, 101, 102, 162, 197, 201 use the division method of hashing with a table size of 11. Use the sequential method of resolving collision.

(4 × 5 = 20 marks)

Part C

Answer section (a) **or** *section (b) of each question.*

C. (1) (a)   Consider the following functions :—

int F (int n, int m)

$\{$if $(n <= 0)$ or $(m <= 0)$ then return 1

else return

$$\big(F(n-1, m) + F(n, m-1)\big);$$

$\}$

Use the recurrence relation :

$$\binom{n}{k} = \binom{n-1}{k} + \binom{n-1}{k-1}$$

to answer the following questions. Assume that n, m are positive integers

  (i)   What is the value of F (n, 2) ?

  (ii)   What is the value of F (n, m) ?

Or

(1) (b)   Explain Big oh, Big Omega and Big Theta notations. Worst case time complexity of Bubble sort is given by $T(n) = T(n-1) + n$. Find Big oh notation representing this time complexity.

2 (a) Write short notes on :

   (i) Stack ; (ii) Sparsh matrices (iii) Circular linked list ; and (iv) Dequeue.

Or

  (b) (i) Write an algorithm to insert an element in doubly linked list .

   (ii) Write an algorithm to implement queue using linked list.

3 (a) Obtain AVL tree sorting with an empty binary tree on the following sequence :

   December, January, April, March, July, August, October, February, November, May, June.

Or

  (b) Define a B-tree of order M. Build a B-tree by inserting records with following key sequence, into an empty B-tree of order 4 :—

   a, g, f, b, k, d, h, m, j, e, s, i, r, x, c, l, n, t, n, p.

4 (a) Write the recursive algorithm for quicksort. Apply the algorithm for following array of elements. 25, 11, 57, 48, 37, 12, 92, 85. (Show only first partition.)

Or

  (b) Sort the following array of elements through HEAP SORT and merge sort.

   25, 37, 48, 11, 12, 92, 57, 85. Show all the steps.

                                                              (4 × 10 = 40 marks)