USN | | | | | | | | | | | 10CS35

Third Semester B.E. Degree Examination, June/July 2016
Data Structures with C

Time: 3 hrs.   Max. Marks:100

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

PART – A

1 a. Write a recursive function to print the permutation of a string (ABC) passed to it as an argument.   **(06 Marks)**
   b. What is the purpose of using free( )? With an example explain the problem that occur when free( ) is not used.   **(04 Marks)**
   c. Obtain the step count for the C – function to add two matrices of M × N size using counting method and tabular method.
      void add_matrix(int a[ ][MAX_SIZE], int b[ ][MAX_SIZE], int c[ ][MAX_SIZE], int m, int n)
      { int i, j ;
          for (i = 0 ; i < m; i ++)
          {
              for (j = 0 ; j < n; j++)
              {
                  C[i][j] = a[i][j] + b[i][j] ;
              }
          }
      }   **(04 Marks)**
   d. Explain how memory can be dynamically allocated using realloc( ).   **(06 Marks)**

2 a. Explain how address calculation is done in row major ordering for a 2–dimensional array. Also generalize for n–dimension.   **(04 Marks)**
   b. Describe unions used in C. How is it different from structures?   **(06 Marks)**
   c. Design an algorithm to add two polynomials using ADT polynomial.   **(05 Marks)**
   d. With the help of an example, explain sparse matrix. How the sparse matrix is represented in memory. Design the algorithm to transpose a given matrix represented as triples in a 1–D array.   **(05 Marks)**

3 a. Write an algorithm to evaluate a postfix expression. Use a stack to evaluate the following postfix arithmetic expression. Show the changing status of the stack in tabular form.
      (AB + C – B A + C $ –)for given A = 1, B = 2, C = 3.   **(06 Marks)**
   b. Differentiate between stack and queue. How are they related to LIFO and FIFO concept?
                                                                              (06 Marks)
   c. Write a program to check whether a given string is palindrome or not using stack. **(04 Marks)**
   d. What is the disadvantage of queue which is implemented using array and how to overcome it?   **(04 Marks)**

4 a. Write a program that create a linked list consisting of nodes of the following struct type and searches the record of a student whose roll_number is given by the user.

sturct student
{
char name [15];
int roll_no ;
struct student *next ;
} ;   **(10 Marks)**

b. List out the difference between singly linked list and doubly linked list. What are the advantages of circular list?   **(05 Marks)**

c. Explain how to reverse and invert a given singly linked list with an example and write its C-function.   **(05Marks)**

PART – B

5 a. Write a C – function to insert an item into a binary tree based on direction.   **(06 Marks)**

b. Define max-heap and min-heap. How will you represent a max-heap as an array? Write an algorithm to insert an element to a max-heap. Create a max-heap : 100 200 –10 –30 –60 80 90 300.   **(08 Marks)**

c. List various types of threaded binary trees. Explain in-threaded binary tree.   **(06 Marks)**

6 a. Suppose the following list of number is inserted in order into an empty binary search tree(BST) 70 80 60 65 50 45 55,
   i)   Construct the binary search tree
   ii) Find in order, pre-order and pos-order traversal of BST created
   iii) Is the BST constructed at AVL tree? State reasons for your claim. Further if your answer is negative balance the tree so that it becomes an AVL tree.   **(10 Marks)**

b. Explain the activities to be performed to delete a node from a binary tree and write C–function to delete an item from the tree.   **(10 Marks)**

7 a. Obtain the shortest(x) and weight(x) for each node in the following binary trees and identify which is height – based leftist tree and which is weight–based leftist tree.   **(10 Marks)**
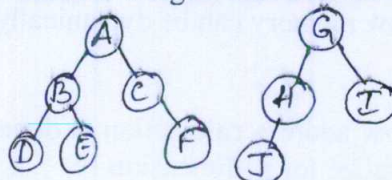

Fig. Q7(a)

b. Construct an AVL tree by inserting the elements MAR, MAY, NOV, AUG, APRIL, JAN, DEC, JULY, FEB, JUNE, OCT, SEPT.   **(10 Marks)**

8 a. Obtain the optimal binary search tree for the following items and associated probability.
Keys   10   15   20   25
Probability   3   3   1   1.   **(10 Marks)**

b. Define RED–BLACK trees. Consider the red–black tree shown below and insert the item 50 into the tree and write the final red–black tree.   **(10 Marks)**
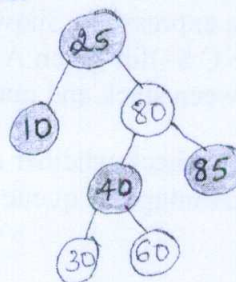

Fig. Q8(b)

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