Code: AE52/AC52/AT52   Subject: C & DATA STRUCTURES

AMIETE – ET/CS/IT (NEW SCHEME)

Time: 3 Hours   **DECEMBER 2011**   Max. Marks: 100

NOTE: There are 9 Questions in all.

- **Please write your Roll No. at the space provided on each page immediately after receiving the Question Paper.**
- **Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.**
- **The answer sheet for the Q.1 will be collected by the invigilator after 45 Minutes of the commencement of the examination.**
- **Out of the remaining EIGHT Questions answer FIVE Questions, selecting at least TWO questions from each part. Each question carries 16 marks.**
- **Any required data not explicitly given, may be suitably assumed and stated.**

Q.1   Choose the correct or the best alternative in the following: (2×10)

a. The number of swappings needed to sort the numbers 8, 22, 7, 9, 31, 19, 5, 13 in ascending order, using bubble sort is

   (A) 11   **(B)** 12
   (C) 13   **(D)** 14

b. Preorder is same as

   (A) depth- first order   **(B)** breadth –first order
   (C) topological order   **(D)** linear order

c. The depth of a complete binary tree with 'n' nodes is (log is to base two)

   (A) $\log (n + 1) - 1$ **(B)** $\log (n)$
   (C) $\log (n - 1) + 1$ **(D)** $\log (n) + 1$

d. The number of possible binary trees with 3 nodes is

   (A) 12   **(B)** 13
   (C) 5   **(D)** 15

e. The postfix equivalent of the prefix * + a b - c d is

   (A) a b + cd - *   **(B)** a b c d + - *
   (C) ab + cd * -   **(D)** a b + - c d *

f. The minimum number of edges in a connected cyclic graph on n vertices is

   (A) n -1   **(B)** n
   (C) n +1   **(D)** none of the above

g. Which of the following is useful in implementing quick sort?

   (A) Stack   **(B)** Set
   (C) List   **(D)** Queue

h. The concatenation of two lists is to be performed in O(1) time. Which of the following implementations of a list could be used?

(A) Singly linked list   **(B)** Doubly linked list
(C) Circular doubly linked list   **(D)** Array implementation of list

i. The average number of comparisons performed by the merge sort algorithm, in merging two sorted lists of length 2 is

(A) 8/3   **(B)** 8/5
(C) 11/7   **(D)** 11/6

j. For merging two sorted lists of sizes m and n into a sorted list of size m+n, we require comparisons of

(A) $O(m)$ **(B)** $O(n)$
(C) $O(m+n)$ **(D)** $O(\log(m) + \log(n))$

PART (A)
Answer at least any TWO Questions. Each question carries 16 marks.


Q.2 a. Perform the following conversions:

(i) $(4822.2)_{10}$ $= (?)_2$

(ii) $(7541.45)_8$ $= (?)_{10}$ **(5)**

b. List the different data types in C.   **(5)**

c. Write a C program to read any two floating point numbers from the keyboard and display their sum, difference, product and division.   **(6)**

Q.3 a. Write a C program to find the largest value from four numbers.   **(6)**

b. Explain the for-loop as used in C. Write a C program to display numbers from 0 to10 using for loop.   **(6)**

c. Explain the break statement in C with its syntax and example.   **(4)**

Q.4 a. What is a recursive function? Write a C program to find the factorial of a given number using recursive function.   **(6)**

b. A two dimensional array defined as A [3:7, -1:4] requires 4 words per memory cell. Find the location of A [5, 2] if the array is implemented in row major order. The base address is given as 200.   **(6)**

c. Write a C program for traversing the elements of an array.   **(4)**

Q.5 a. Explain the following string functions.   **(6)**
(i)   strcat ( )
(ii) strcpy ( )
(iii) strrev ( )

b. What is a file? Explain any two file operations.   **(4)**

c. Write a C program to declare a member of a union as a structure data type and
    to display the contents of the union.   **(6)**

PART (B)
Answer at least any TWO Questions. Each question carries 16 marks.

Q.6 a. Write down Bubble sort algorithm. Sort the following list using Bubble sort
         and find its complexity.
         15, 10, 20, 25, 5   **(8)**

         b. Write an algorithm to delete the root of a heap.   **(8)**

Q.7 a. Write an algorithm to insert a node at a specified position in a singly link list
                                                                              (8)

         b. Convert the following infix expression into postfix expression using stack.
         A + (B * C - (D/E ^ F) * G) * H   **(8)**

Q.8 a. The following sequence gives the preorder and inorder traversals of a binary
         tree T :
         Preorder: A B D G C E H I F
         Inorder : D G B A H E I C F
         Draw the tree. Also find the postorder of the tree.   **(8)**

         b. What is a binary search tree? Insert the following numbers in to an empty
         binary search tree: 40, 60, 50, 33, 55, 11.   **(8)**

Q.9 a. Generate minimum cost spanning tree for the following graph using prim's
         algorithm.   **(8)**
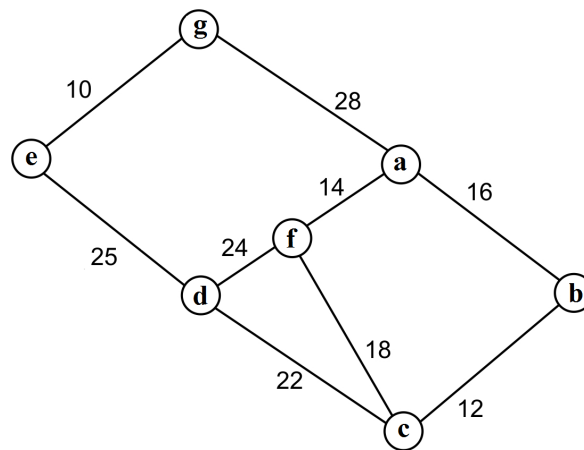
         b. Write a program in C to implement depth first search algorithm. **(8)**