Subject: DATA STRUCTURES

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

DECEMBER 2010

NOTE: There are 9 Questions in all.

- **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 half an hour of the commencement of the examination.**
- **Out of the remaining EIGHT Questions answer any FIVE Questions. 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. With every use of memory allocation function, what function should be used to release allocated memory which is no longer needed?

(A) dropmem( ) **(B)** dealloc( )
(C) release( ) **(D)** free( )

b. A recursive function would result in infinite recursion, if the following were left out:

(A) Base case **(B)** Recursive call
(C) Subtraction **(D)** Local variable declarations

c. What will be the size of following union declaration?

```
union Test {
 int x;
char y;
float z; } ;
```

(A) 7 bytes **(B)** 4 bytes
(C) 1 byte **(D)** none of the above

d. The time complexity of binary search in average case is

(A) $O(\log_2 n)$ **(B)** $O(n)$
(C) $(O(n \log_2 n)$ **(D)** $O(n^2)$

e. In selecting the pivot for QuickSort, which is the best choice for optimal partitioning:

(A) The first element of the array
(B) The last element of the array
(C) The middle element of the array
(D) The median of the array

f. One can convert an infix expression to a postfix expression using a

(A) Stack
(B) Queue
(C) Deque
(D) none of these

g. This type of linked list does not have null value in the last node

(A) circular linked list
(B) static list
(C) doubly linked list
(D) none of the above

h. The address field of the linked list

(A) contain address of the next node
(B) contain address of the next pointer
(C) may contain NULL pointer
(D) both **(A)** and **(C)** above

i. Binary Search Tree is a

(A) tree whose right and left sub-tree has value less than root.
(B) tree whose right and left sub-tree has value more than root.
(C) tree whose left sub-tree has value less than root and right sub-tree has value more than root.
(D) none of the above

j. Breadth-first traversal(BFS) is a method to traverse

(A) all successors of a visited node before any successors of any of those successors
(B) a single path of the graph as far it can go
(C) the graph using the shortest path
(D) none of these

Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.

Q.2 a. What are static variable? Compare with standard local variable. **(4)**

b. What is recursion? Explain with suitable example. List out their merits and demerits. **(8)**

c. What is dynamic memory allocation? Discuss the dynamic memory allocation with the help of a suitable example **(4)**

Q.3 a. What is union? How is it different from structure? With suitable example show how union is declared and used in C. **(6)**

b. Explain the following types of file **(10)**
(i) sequential
(ii) Index sequential
(iii) Direct file

Q.4 a. Write a C routine to search an element using binary search method. **(8)**

b. Write a C routine to sort an array of integer using quicksort method. **(8)**

Q.5 a. Convert the following infix expressions to its corresponding prefix and postfix expressions
(i) (A + B) / (D + E)
(ii) $A * B - (C + D) * (P/Q)$ **(4, 4)**

b. What is circular queue? Write the implementation of circular queue using array. **(8)**

Q.6 a. Write a C program to delete a node with the minimum value from a singly linked list. **(8)**

b. Write a C function to add two polynomials when the polynomials are represented using singly linked lists. **(8)**

Q.7 a. Write a C function to reverse a singly linked circular list. **(8)**

b. What is doubly linked list? Write C routines to insert into and delete elements from a doubly linked list. **(8)**

Q.8 a. Explain clearly, with examples the concepts of the following
(i) depth of tree (ii) binary tree
(iii) full binary tree (iv) complete binary tree **(2,2,2,2)**

b. Write a function to search for an item using a binary search tree. **(8)**

Q.9 a. Explain the DFS and BFS traversals in a graph and write the algorithm. **(12)**

b. Given the following graph, write the depth first spanning tree. **(4)**