**3046**

Reg. No. : ......................................

Name : ......................................

## Third Semester B.Tech. Degree Examination, April 2015
### (2013 Scheme)
### 13.306 : DATA STRUCTURES AND ALGORITHMS (FR)

Time : 3 Hours

Max. Marks : 100

## PART – A

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

1. Determine the frequency counts for all statements in the following code segment

   for i = 1 to n do

      for j = 1 to I do

         for k = 1 to j do

            x = x + 1 ;    2

2. Define big – O    2

3. Write the pseudo code for inserting an item into the circular queue.    2

4. List four applications of Trees.    2

5. Define internal fragmentation and external fragmentation.    2

6. What is Garbage collection ?    2

7. What is the worst case time complexity of quick sort algorithm ? Explain.    2

8. List four methods to build a hashing function.    2

9. How a graph is converted into a matrix ? Explain.    2

10. What is the idea behind insertion sort algorithm ?    2

**(10×2=20 Marks)**

## PART – B

Answer **one full** question from **each** Module. **Each** question carries **20** marks.

### Module – I

11. a) Explain the operations of Doubly Linked List (DLL) in detail with routines to add and delete node from DLL.                                           **10**

   b) Give the best asymptotic ("big-Oh") characterization of the worst case and the best case time complexities of the algorithm MultAdd (A, n) given below :    **6**

   Algorithm MultAdd (A, n)

   Input : Array A storing integers and of size n > 1000.

   sum = 0

       for c = 0 to 1000 do

        if A [c] < 0 then

         for k = 0 to n – 1 do

          sum = sum + k* A[c]

   c) What is meant by analysis of algorithms ? Explain.                          **4**

12. a) Given two sorted lists, L1 and L2, write a procedure in pseudo code to Compute L1 ∩ L2 using only the basic list operations.                               **7**

   b) Compare two functions $n^2$ and $2^n/4$ for various values of n. Determine when the second becomes larger than the first. What is your observation about this ?    **5**

   c) What is meant by stepwise refinement ? Explain with an example.            **8**

### Module – II

13. a) Write an algorithm to convert an infix expression to prefix expression. Illustrate the working of the algorithm with an example : $(A+(B*C)/G^H$.            **10**

   b) Write the recursive version of pre-order traversal.                        **4**

   c) Explain how to represent complete binary tree using array. Write routines for accessing parent, left and right child of the representation.                  **6**

14. a) Let T be a full binary tree with 111 internal nodes. What is the maximum and minimum heights it can have ?    4

   b) List four applications of graph data structures.    4

   c) What are the important points to be considered while selecting data structures for a given data object ? Highlight your claim by taking string representation as an example.    8

   d) List the properties of binary search trees.    4

## Module – III

15. a) What are the limitations of reference counts ? Explain.    8

   b) Explain boundary tag method.    5

   c) What is a buddy ? Explain.    7

16. a) Compare first fit and best fit strategy with examples.    7

   b) List major issues in memory management.    5

   c) Explain garbage collection algorithm for making accessible cells.    8

## Module – IV

17. a) Consider a hash table of size 13 storing entries with integer keys. Suppose the hash function is h(k) = k mod 13. Insert, in the given order, entries with keys 10, 3, 6, 16, 17, 19 into the hash table using Linear probing to resolve collisions. Show all the work.    10

   b) Explain heap sort algorithm with the following input

      32    23    –34    456    12    1    10

18. a) Compare linear and binary search algorithms.    8

   b) Write brief note on the following :    12

      i) Overflow handling in hashing

      ii) Collision handling

      iii) Digit analysis.