**D 1822**

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Name......................

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

# THIRD SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, DECEMBER 2004

## CS/IT 2K/PTCS2K 302. DATA STRUCTURES AND ALGORITHMS

Time : Three Hours

Maximum : 100 Marks

*Answer* **all** *the questions.*

1. (a) What are the primitive data types ? Explain with examples.

   (b) What is data abstraction ? Explain.

   (c) List few applications of queues.

   (d) Formulate an algorithm to perform an insertion of a node with info X, into a singly linked list, whose first node is pointed to by the pointer variable FIRST.

   (e) How are trees stored in the memory of the computer ? Explain with examples.

   (f) Explain how a set can be implemented using strings.

   (g) What is hashing ? Why is it required ? Explain the working of any *one* hashing function.

   (h) Compare the searching done on arrays with that of linked list.

   (8 × 5 = 40 marks)

2. (a) With an example, analyse the time and space complexity of an algorithm.  (15 marks)

   *Or*

   (b) Explain the usage of the following data types :

   (i) Records.

   (ii) Sets.

   (iii) Strings.
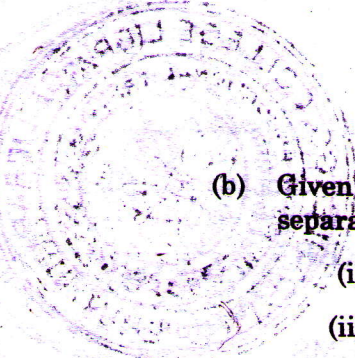
   (iv) Subrange.

   (v) Structure.

   (5 × 3 = 15 marks)

3. (a) (i) Given a circular queue of size N, write an algorithm to perform insertion and deletion operations from the queue, if the queue is implemented using linked allocation.

   (10 marks)

   (ii) What is a priority queue ? How is it useful ? Explain.   (5 marks)

   *Or*

**Turn over**

(b) Given singly linked list, whose first node is pointed by a pointer variable FIRST, formulate separate algorithms to :

   (i)    Insert a node X into an ordered list.

   (ii)    Delete a node with info Y.

   (iii)    Search for a node with info Z.

                                              (3 × 5 = 15 marks)

4. (a) With a sample graph, state and explain the algorithm to perform depth first traversal of the graph.

                                      *Or*

(b) Given a rexically ordered tree, whose root node is pointed to by the pointer variable T, formulate an algorithm to delete a node with info A from the tree.

                                               (15 marks)

5. (a) State and explain the algorithm to create a heap of elements and to sort the heap.

                                               (15 marks)

                                    *Or*

(b) (i) State the algorithm to perform selection sort.                 (7 marks)

     (ii) Analyse the time complexity of the merge sort algorithm.       (8 marks)

                                         [4 × 15 = 60 marks]