

G 6160

M.E. DEGREE EXAMINATION, MAY/JUNE 2007.

First Semester

Computer Science and Engineering

CS 1602 – DATA STRUCTURES AND ALGORITHMS

(Regulation 2005)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define ADT Pointer.

2. How many pointers need to be modified in the following operations :

- Insert an element at the beginning of a singly linked circular list with head node.
- Delete an element in the middle of a circular doubly linked chain.
- Delete an element at the beginning of the circular singly linked list with tail pointer.
- Delete an element at the middle of the doubly linked circular list with head pointer.

3. "Binary Search trees the best worlds of arrays and linked lists into one structure". Comment.

4. How do array based circular queue compares with linked circular queues?

5. Compare any two form SET implementation.

6. Is graph a linear or non-linear or hierarchical form of data structure? Justify your answer.

7. Compare and contrast internal fragmentation and external fragmentation in memory management.

8. Enumerate the merits and demerits of automatic garbage collection.

9. What do you mean by stable sorting algorithm? Give an example for a stable sorting algorithm and an application where we need it.
10. Compare and contrast Divide and Conquer and Backtracking algorithm design approaches.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain how to add and delete an element from a doubly linked chain with head pointer. (10)
- (ii) Let P be a pointer to a singly linked list and Q is a pointer. Find out the effect of the following statements. Each node consists of two fields namely Data and Next. Next field is points to the same node type.

$$Q = P \rightarrow \text{Next}$$

$$P \rightarrow \text{Next} = Q \rightarrow \text{Next}$$

$$P \rightarrow \text{Next} = (Q \rightarrow \text{Next}) \rightarrow \text{Next}$$

$$(P \rightarrow \text{Next}) \rightarrow \text{Next} = Q. \quad (6)$$

Or

- (b) (i) Discuss any possible scheme to implement the following : (10)
- (1) Dynamic Array – Number of values and data type of the array elements are decided at run time.
- (2) Varying Array – Number of values decided at run time and data type and maximum number of values are decided at translation time.
- (ii) Write a critical essay about for and against the Pointer type. Enumerate common errors in pointer usage. (6)
12. (a) Write and explain an algorithm that takes two strings of alphabets. One string represents an in order traversal of a binary tree in which each node contains one alphabet ; the second string represents a pre order traversal of the same tree. Assume that no two nodes of the tree contain the same letter. The algorithm is to determine whether there can be such tree. If there is a tree, output a string that represents the post order traversal of the tree. (16)

Or

- (b) (i) Write and explain a recursive algorithm to convert the PREFIX form expression into POSTFIX form of the expression. Trace this with simple example. (10)
- (ii) Discuss an application for each type of queue data structures. (6)

- stable
design
13. (a) Write an algorithm which helps for a railway passenger to know whether there exists a path from a given city to a another city i.e. does there exists a railway link direct or indirect. Which way graph represented in memory? Why? Explain. (16)

Or

- (b) Explain an algorithm how a Heap tree can be used to implement a priority queue. Give simple example. Find out the time complexity for insertion and deletion operation. (16)

- linked
(10)
d out
two
node
14. (a) (i) Discuss the impact of equal size and mixed size blocks based storage allocation. (10)
(ii) Identify the various data structures possible to use for Memory management. (6)

Or

- (b) Explain the various aspects of Buddy systems and Storage Compactions. (16)

- (6)
15. (a) Explain how to implement merge sort with and without recursion. Analyze the performance both. (10 + 6)

Or

- (10)
- (b) Explain any TWO of the following : (8 + 8)
(i) Abstraction and software development.
(ii) Algorithm design techniques.
(iii) Notations for Algorithm analysis.