



Name :

Roll No. :

Invigilator's Signature :

CS/B.TECH (CSE-OLD)/ IT (O), ECE (O), EE (O), EEE (O), ICE (O)/SEM-3/CS-302/2012-13

2012

DATA STRUCTURE & ALGORITHMS

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following :

10 × 1 = 10

- i) Inserting a new node after a given node in a doubly linked list requires
- a) four pointer exchanges
 - b) two pointer exchanges
 - c) one pointer exchanges
 - d) np pointer exchange.

3001 (O)

[Turn over

CS/B.TECH (CSE-OLD)/ IT (O), ECE (O), EE (O), EEE (O), ICE (O)/SEM-3/CS-302/2012-13



- ii) A complete binary tree with n leaves contains
- n nodes
 - $\log_2 n$ nodes
 - $2n - 1$ nodes
 - 2^n nodes.
- iii) A vertex of degree one is called
- Isolated vertex
 - Pendant vertex
 - Coloured vertex
 - Null vertex.
- iv) A sort, which iteratively passes through a list to exchange the first element with any element less than it and then repeats with a new first element, is called
- Bubble sort
 - Selection sort
 - Heap sort
 - Quick sort.
- v) The postfix equivalent of the prefix $* + ab - cd$ is
- $ab + cd - *$
 - $ab \pm cd^*$
 - $ab + cd^* -$
 - $abcd + - * .$
- vi) A linear list that allows elements to be added or removed at either end but not in the middle is called
- stack
 - queue
 - priority queue
 - none of these.

CS/B.TECH (CSE-OLD)/ IT (O),ECE (O), EE (O), EEE (O), ICE (O)/SEM-3/CS-302/2012-13



vii) Which of the following methods had the best average case complexity for searching ?

- a) Hashing
- b) Sequential search
- c) Random search
- d) Binary search.

viii) The technique of linear probing for collision resolution can lead to

- a) clustering
- b) efficient storage utilization
- c) underflow
- d) overflow.

ix) If a binary tree is threaded for in-order traversal a right NULL link of any node is replaced by the address of its

- a) successor
- b) predecessor
- c) root
- d) own.

x) For a function $f(n) = 1000 n \log n + 500 n^4 + 0.52^n$, we can say that $f(n)$ is

- a) $O(n^4)$
- b) $O(n \log n)$
- c) $O(2^n)$
- d) none of these.

CS/B.TECH (CSE-OLD)/ IT (O), ECE (O), EE (O), EEE (O), ICE (O)/SEM-3/CS-302/2012-13

**GROUP – B****(Short Answer Type Questions)**Answer any *three* of the following. $3 \times 5 = 15$

2. Discuss the advantages and disadvantages of linked list over array as linear data structure and also write down the function to insert an element into a sorted array of descending order.
3. Define hashing. Explain with a suitable example the collision resolution technique using linear probing with open addressing.
4. Define big O notation. What is stack and why is this called LIFO ?
5. Write the algorithm for in-order traversal of a threaded binary tree.
6. Prove that for any non-empty binary tree T , if n_0 is the number of leaves and n_2 be the number of nodes having degree 2 then prove

$$n_0 = n_2 + 1.$$
7. Write an algorithm to delete a node from a doubly linked list, where a node contains one data and two addresses (previous and next) portion.

CS/B.TECH (CSE-OLD)/ IT (O),ECE (O), EE (O), EEE (O), ICE (O)/SEM-3/CS-302/2012-13

**GROUP – C****(Long Answer Type Questions)**Answer any *three* of the following. $3 \times 15 = 45$

8. a) Write the algorithm of binary search and calculate the complexity for best, worst and average cases.
- b) Why is queue data structure called FIFO ?
- c) Construct the following queue of characters where queue is a circular array which is allocated six memory cells.

FRONT = 2, REAR = 4 & QUEUE : , A, C, D, ,

Describe the queue as the following operations take place :

- i) F is added to the queue.
- ii) Two characters are deleted from the queue.
- iii) K, L, M are added into the queue.
- iv) R is added to the queue.
- v) One character is deleted from the queue.

CS/B.TECH (CSE-OLD)/ IT (O), ECE (O), EE (O), EEE (O), ICE (O)/SEM-3/CS-302/2012-13



9. a) How can a polynomial such as $5x^8 + 600x^5 + 45x^2 - 5x + 56$ be represented by a linked list.
- b) Write the algorithm to reverse linked list.
- c) What is dummy node in a linked list.
- d) Write the function in c language to find the predecessor of a node in linked list.

10. a) The in-order & pre-order traversal sequences of nodes in a binary tree are given as follows :

<i>In :</i>	D	G	B	A	H	E	I	C	F
<i>Pre :</i>	A	B	D	G	C	E	H	I	F

Draw the binary tree. State the algorithm to construct the tree.

- b) Insert the following keys in order given below to build them into an AVL tree :
- g, h, s, l, e, m, t, u.
- c) What is two-way threading ?
11. a) What is stack ?
- b) Write the algorithm to evaluate postfix expression using stack data structure, and hence evaluate following postfix expression :

$$5 + 67 + -$$

- c) Convert the following infix expression into equivalent postfix expression :

$$a + b * c + (d * e + f) * g.$$

3001 (O)

6

CS/B.TECH (CSE-OLD)/ IT (O),ECE (O), EE (O), EEE (O), ICE (O)/SEM-3/CS-302/2012-13



12. Write short notes on the following :

- a) Quick sort
 - b) *B*-tree
 - c) Tail recursion
 - d) AVL Tree.
-