



Name :

Roll No. :

Invigilator's Signature :

CS/B.TECH(BT)OLD/SEM-3/CS-315/2012-13

2012

DATA STRUCTURE AND ALGORITHM

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 any *ten* of the following :

$10 \times 1 = 10$

- i) Suppose the following 8 numbers are inserted in order,
into an empty BST :

52, 31, 39, 20, 68, 35, 60, 40

The final height of the BST will be

- | | |
|------|-------|
| a) 3 | b) 4 |
| c) 5 | d) 9. |
- ii) A tree is called a binary tree because
- | |
|---|
| a) it is useful in binary search algorithm |
| b) each node can have utmost two children |
| c) each node can store a maximum of two values |
| d) each node can store values of two different types. |



- iii) Example of a non-linear data structure is
 - a) Array
 - b) ~~Linked-list~~
 - c) Graph
 - d) none of these.
- iv) Best possible run-time complexity for any searching algorithm is
 - a) $O(n \log n)$
 - b) $O(\log n)$
 - c) $O(\log \log n)$
 - d) $O(n)$.
- v) In a complete graph number of edges with 8 vertices is
 - a) 56
 - b) 28
 - c) 16
 - d) 24.
- vi) What traversal technique lists the nodes of a binary search tree in ascending order ?
 - a) Post-order
 - b) In-order
 - c) Pre-order
 - d) none of these.
- vii) Which of the following sorting procedures is the slowest ?
 - a) Quick sort
 - b) Heap sort
 - c) Merge sort
 - d) Bubble sort.
- viii) In C language malloc() returns
 - a) integer pointer
 - b) structure pointer
 - c) null pointer
 - d) void pointer.
- ix) In array representation of Binary tree, if the index number of a child node is 6 then the index number of its parent node is
 - a) 2
 - b) 3
 - c) 4
 - d) 5.
- x) Suppose $S1 = \text{DATA}$ and $S2 = \text{STRUCTURE}$. What will be the output of $S1/S2$?
 - a) DATASTRUCTURE
 - b) DATA STRUCTURE
 - c) DATA
 - d) STRUCTURE.



- xi) In tree construction which is the suitable efficient data structure ?
- a) Linked list b) Stack
c) Queue d) Array.
- xii) The worst-case complexity of quick sort is
- a) $O(n^2)$ b) $O(n \log n)$
c) $O(n)$ d) $O(n^3)$.

GROUP - B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Find out the output of the following program with proper explanation. If there is any error in the program then point it out with proper explanation : 5

```
void main()
{
    int a [5] = { 1, 2, 3, 4, 5 }, i = 0, * p ;
    for( p = a + 4 ; i < 5 ; i ++ )
        printf( "%d", p[i] ) ;
}
```

3. "Binary search technique cannot be implemented using Linked list." Is the statement valid ? Briefly explain. 5
4. Prove that maximum number of nodes possible in a binary tree of height h is $2^h - 1$. 5
5. a) What is the use of header node in a header linked list ? 2
- b) Let a polynomial $P(x) = 2x^8 - 3x^5 + 4x^3 - 2$. Represent this polynomial using circular header linked list. State the role of header node in representing this polynomial. 3



GROUP - C

(Long Answer Type Questions)

Answer any *three* of the following questions.

$$3 \times 15 = 45$$

6. a) Write an algorithm for searching an element from a Binary search tree.
b) Construct a binary tree of $(A - B) + C * (D/E)$. Now represent it in an array form. Find the locations of *D* and *E*.
c) Suppose the following sequences list the nodes of a binary tree *T* in pre-order and in-order, respectively :
Pre-order : G, B, Q, A, C, K, F, P, D, E, R, H
In-order : Q, B, K, C, F, A, G, P, E, D, H, R
Draw the diagram of the tree. $6 + 3 + 6$
7. a) Define Hashing.
b) Explain with a suitable example the collision resolution scheme using linear probing with open addressing.
c) What is the difference between index file system and index sequential file system ?
d) Explain the Direct File Organization technique. $2 + 4 + 2 + 7$
8. a) Describe the advantages and disadvantages of the linked and array representations of a binary tree.
b) What is Balance Factor in an AVL tree ?
c) Construct an AVL tree with the following data :
3, 5, 11, 8, 4, 1, 12, 7, 2, 6, 10. $5 + 2 + 8$
9. Write short notes on any *three* of the following : 3×5
a) Circular queue
b) Quadratic probing
c) Index Sequential File Organization
d) Sequential Search
e) Sparse Matrix.

