



**MAULANA ABUL KALAM AZAD UNIVERSITY OF
TECHNOLOGY, WEST BENGAL**

Paper Code : BCA-302

DATA STRUCTURE WITH C

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) Prefix notation is also known as
 - a) reverse polish notation
 - b) reverse notation
 - c) polish reverse notation
 - d) polish notation.

- ii) The searching an element in a hash table of size m with n keys requires
- a) $O(n)$ comparisons
 - b) $O(m/n)$ comparisons
 - c) $O(m)$ comparisons
 - d) $O(n/m)$ comparisons.
- iii) The complexity of linear search algorithm is
- a) $O(n)$
 - b) $O(\log n)$
 - c) $O(n^2)$
 - d) $O(n \log n)$.
- iv) The best data structure to see whether an arithmetic expression has balanced parenthesis is a
- a) stack
 - b) queue
 - c) tree
 - d) list.
- v) The sparse matrix is a matrix whose
- a) most of the elements are non-zero
 - b) most of the elements are zero and half of the elements are non-zero
 - c) half of the elements are zero
 - d) none of these.

vi) The postfix notation is also known as

- a) polish notation
- b) reverse polish notation
- c) reverse notation
- d) none of these.

vii) For any non-empty binary tree T , if n is the number of nodes and e is the number of edges, then the relation between e and n is

- a) $e = n - 1$
- b) $e = n + 1$
- c) $e + 1 = n$
- d) $e = n$.

viii) When determining the efficiency of algorithm the time factor is measured by

- a) counting microseconds
- b) counting the number of key operations
- c) counting the number of statements
- d) counting the kilobytes of algorithm.

- ix) A data structure where elements can be added or removed at either end but not in the middle is
- a) linked list b) stack
 - c) queue d) deque.
- x) Complexity expressed in O -notation is
- a) lower bound
 - b) upper bound
 - c) middle between (a) and (b)
 - d) none of these.
- xi) When the malloc() function returns NULL value it means
- a) memory is not allocated
 - b) memory is allocated but no data entered
 - c) both (a) and (b)
 - d) none of these.

GROUP - B

(Short Answer Type Questions)

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

2. Write a C function to implement 'PUSH' and 'POP' operations in a stack. $2\frac{1}{2} + 2\frac{1}{2}$

3. Convert the following infix expression into postfix form by using stack :

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

4. What are the advantages of linked list over array ?
What are the disadvantages over array ? $2\frac{1}{2} + 2\frac{1}{2}$
5. What is B-tree ? What is the difference between a B-tree and a B+tree ? $3 + 2$
6. What is dequeue ? What is the advantage of dequeue over ordinary queue ? $3 + 2$

GROUP - C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) What are the differences between general tree and a binary tree ? 2
- b) Prove that the height h of a binary tree T is $h = \log_2 (n + 1)$. 3
- c) Construct a B-tree of order 5 from the following key values : 5
a, g, f, b, k, d, h, m, j, e, s, i, r, x, c, l, n, t, u, p
- d) What is hashing ? How is collision problem solved in hashing ? $1 + 4$

8. a) Explain with an example the heap sort algorithm.
b) Write an algorithm for this heap sort.
c) Find the time complexity of the above algorithm.

5 + 5 + 5

9. Write the functions for the following :

- a) Insert a node after a particular node in singly linked list.
b) Reverse display of the list in doubly linked list.
c) Physically reverse the singly linked list. 5 + 5 + 5

10. a) What is an adjacency matrix representation of a graph ?
b) Prove that maximum number of nodes on level i of a binary tree is 2^{i-1} , $i \geq 1$.
c) What is the difference between recursion and iteration ?
d) What will be the complexity for the following operations—quick sort, binary search, selection sort ?

5 + 3 + 2 + 5

11. Write short notes on any *three* of the following : 3 × 5

- a) AVL tree
 - b) Threaded binary tree
 - c) Search algorithm of BST
 - d) Priority queue
 - e) ADT.
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