



BRAINWARE UNIVERSITY

Course – MCA

Data Structure with Python (MCA202)

(Semester – 2)

Time allotted: 3 Hours

Full Marks : 70

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group –A

(Multiple Choice Type Question)

10 x 1 = 10

1. Choose the correct alternative for the following: (*Any ten*)

- (i) The time complexity of Bubble Sort in the best case is
- | | |
|------------------|----------------|
| a) $O(n)$ | b) $O(n^2)$ |
| c) $O(n \log n)$ | d) $O(\log n)$ |
- (ii) What is suitable efficient data structure to construct a graph?
- | | |
|----------|------------------|
| a) Stack | b) Linked List |
| c) Queue | d) None of these |
- (iii) The following sequence of operations is performed on a stack:
 push(1), push(2), pop, push(1), push(2), pop, pop, pop, push(2), pop
 The sequence of popped out values are
- | | |
|------------------|------------------|
| a) 2, 2, 1, 2, 1 | b) 2, 2, 1, 1, 2 |
| c) 2, 1, 2, 2, 1 | d) 2, 1, 2, 2, 2 |
- (iv) The time complexity of Selection Sort algorithm is
- | | |
|-------------|------------------|
| a) $O(n)$ | b) $O(\log n)$ |
| c) $O(n^2)$ | d) $O(n \log n)$ |

- (v) Prerequisite of Binary Search is
- a) Array must be sorted in ascending order
 - b) Array must be sorted in descending order
 - c) Either (a) or (b)
 - d) None of these
- (vi) The memory address of the first element of an array is called
- a) floor address
 - b) foundation address
 - c) first address
 - d) base address
- (vii) An Array follows
- a) Random Access Mechanism
 - b) Sequential Access Mechanism
 - c) No Access Mechanism
 - d) None of these
- (viii) The prefix notation of $A*B+C/D$ is
- a) $AB*CD/+$
 - b) $ABCD*/+$
 - c) $AB+CD/*$
 - d) $+*AB/CD$
- (ix) The maximum number of nodes at level t in a complete binary tree is (level starts from 0)
- a) $2*t$
 - b) 2^t
 - c) t
 - d) none of these
- (x) B-Tree is
- a) unbalanced binary tree
 - b) binary search tree
 - c) m-way search tree
 - d) none of these
- (xi) Queue uses which of the following strategy?
- a) LIFO
 - b) FIFO
 - c) both (a) & (b)
 - d) none of these

Group – B

(Short Answer Type Question)

3 x 5 = 15

Answer *any three* of the following

2. Write the algorithms to insert and delete operation of a linear Queue.
3. Construct the binary tree from the following information:

Inorder : A D J M H K F C I N L G E B

Preorder : A B C D F H J M K E G I L N

4. Write down the algorithm of the conversion of postfix expression from infix expression.
5. Write a Python function to insert a node at the front of a singly linked list.
6. Write down the BFS algorithm.

Group – C

(Long Answer Type Question)

3 x 15 = 45

Answer *any three* of the following

7. (a) How can a polynomial such as $5x^2 - 7x + 9$ be represented by a linked list?
- (b) Write an algorithm to delete a node from a doubly linked list.
- (c) “Binary search is better than linear search” – Justify.

[5 + 5 + 5]

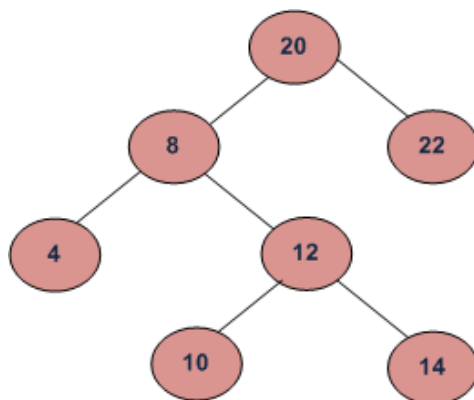
8. (a) Draw a binary search tree whose elements are inserted in the following order:
10, 12, 9, 25, 51, 15, 95
- (b) Write the Python function or algorithm to search a node in a binary search tree.
- (c) What is AVL tree? What is balance factor?

Construct a AVL tree from the following sequence of integers:

50, 96, 98, 107, 26, 1, 9, 2

[4 + 4 + (1 + 1 + 5)]

9. (a) Write an algorithm to delete an element from a Binary Search Tree.
(Include all the cases)
- (b) Consider the following Binary Search Tree and perform the following operation:
(i) delete node 4 (Mention the logic)
(ii) delete node 8 (Mention the logic)



[(2 + 3) + 10]

10. (a) Define B-Tree. Write the properties of B-Tree.
(b) Insert the following into a B-Tree of order 3.
(Mention the logic of each step)

20, 80, 55, 15, 116, 39, 76, 124, 103, 48, 200, 98, 175, 235, 28, 114, 132, 164

[(2 + 3) + 10]

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

[3 x 5 = 15]

- (a) Heap vs. Priority Queue
(b) Binary Tree
(c) Array vs. Linked List
(d) Big-O Notation
(e) Insertion Sort