

PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
B.Tech./Int. Btech Winter 2022 - 23 Examination

Semester: 3/7

Date: 06/10/2022

Subject Code: 203105205

Time: 02:00 pm to 04:30 pm

Subject Name: Data Structure and Algorithms

Total Marks: 60

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 Objective Type Questions - All are compulsory (15)

1. Which case of data structure operation takes the maximum time?
 - A. Worst Case
 - B. Average Case
 - C. Best Case
 - D. None of the above
2. Which of the following is not a Characteristics of a Data Structure?
 - A. Completeness
 - B. Correctness
 - C. Time Complexity
 - D. Space Complexity
3. _____ of an algorithm represents the amount of memory space required by the algorithm in its life cycle.
 - A. Space complexity
 - B. Time Complexity
 - C. Quadratic Complexity
 - D. Exponential Complexity
4. The Omega notation is the formal way to express the _____ of an algorithms running time.
 - A. upper bound
 - B. medium bound
 - C. lower bound
 - D. both the lower bound and the upper bound
5. Which of the following is true?
 - A. A graph may contain no edges and many vertices
 - B. A graph may contain many edges and no vertices
 - C. A graph may contain no edges and no vertices
 - D. None of the mentioned
6. If several elements are competing for the same bucket in the hash table, what is it called?
 - A. Diffusion
 - B. Replication
 - C. Collision
 - D. None of the mentioned
7. Which of these is an application of linked lists?
 - A. To implement file systems
 - B. For separate chaining in hash-tables
 - C. To implement non-binary trees
 - D. All of the mentioned
8. In a Queue, if a user tries to remove an element from empty Queue it is called _____.
 - A. Underflow
 - B. Empty collection
 - C. Overflow
 - D. Garbage Collection
9. If the number of records to be sorted is small, then sorting can be efficient.
 - A. Merge
 - B. Heap
 - C. Selection
 - D. Bubble
10. The postfix form of $A*B+C/D$ is?
 - A. $*AB/CD+$
 - B. $AB*CD/+$
 - C. $A*BC+/D$
 - D. $ABCD+/*$

11. What is the value of the postfix expression $6\ 3\ 2\ 4\ +\ -\ *$:
 - A. Something between -5 and -15
 - B. Something between 5 and -5
 - C. Something between 5 and 15
 - D. Something between 15 and 100
12. The no of external nodes in a full binary tree with n internal nodes is?
 - A. n
 - B. n+1
 - C. 2n
 - D. 2n + 1
13. Which one of the following array elements represents a binary min heap?
 - A. 12 10 8 25 14 17
 - B. 8 10 12 25 14 17
 - C. 25 17 14 12 10 8
 - D. 14 17 25 10 12 8
14. Which is the formal way to express the upper bound of an algorithm's running time.
 - A. Big Oh Notation
 - B. Omega Notation
 - C. Theta Notation
 - D. None of the above
15. Suppose we are sorting an array of eight integers using quicksort, and we have just finished the first partitioning with the array looking like this:
 2,5,1,7,9,12,11,10
 Which statement is correct?
 - A. The pivot could be either the 7 or the 9.
 - B. The pivot could be the 7, but it is not the 9
 - C. The pivot is not the 7, but it could be the 9
 - D. Neither the 7 nor the 9 is the pivot.

Q.2 Answer the following questions. (Attempt any three) **(15)**

- A) Differentiate between data types and data structures.
- B) Evaluate the following postfix expression using stack.
 $12\ 10\ * \ 4\ 57\ +\ -$
- C) Define 1. Acyclic graph 2. Leaf node 3. Complete binary tree
- D) Distinguish between stack and queue.

Q.3 A) Describe various collision resolution techniques in hashing. **(07)**

- B) Examine the algorithm for Insertion sort and sort the following array: 66,44,99,55,11,88,22,77,33 **(08)**

OR

- B) Describe Binary Search Tree and its operations? Construct the Binary search tree:
 45, 15, 79, 90, 10, 55, 12, 20, 50 **(08)**

Q.4 A) Write an algorithm for INSERT operation to insert a node at a given position in a Link list. **(07)**

OR

- A) Create an AVL tree for the following sequence of numbers. Also mention name of action taken. **(07)**

63, 9, 19, 27, 18, 108, 99, 81

- B) What is time and space analysis? How Significant are Space and Time Complexity? **(08)**