

Bharati Vidyapeeth's
Institute of Computer Applications and Management (BVICAM)
A-4, Paschim Vihar, New Delhi-63
THIRD SEMESTER [MCA] Internal Examination, September 2023

Paper Code: MCA-201	Subject: Design and Analysis of Algorithms
Time: 2 Hours	Maximum Marks: 45
Note: Attempt THREE questions in all. Question No. 1 is compulsory, and attempt one question from each unit.	

1. Answer all the following questions briefly: - 5 × 3 = 15
- (a) Differentiate between big oh (O) and little oh (o) asymptotic functions.
 - (b) "Sorting of list" is mandatory before "merging of list" in merge sort. Justify. Can we merge unsorted lists to get sorted list?
 - (c) Evaluate number of multiplications and additions needed to multiply two matrices of order $n \times n$ using traditional Matrix Multiplication method?
 - (d) Illustrate randomized algorithm with the help of an example.
 - (e) Define loop invariant.

UNIT - I

2. (a) Prove that the time complexity of Binary search is $\log n$. 6
- (b) Consider the following part of a Program code: 6.5
- ```

x = c; y = 0;
while (x > 0) {
 x--;
 y++;
}

```
- where, c is any positive integer.
- Show that the while loop terminates after finite steps. Also identify the loop invariant on the while loop.
3. (a) Argue that  $f(n) = 3n^4 - 5n^2$  and  $g(n) = n^4$  are of same order. 5.5
- (b) Illustrate time complexity of merge sort as  $O(n \log n)$ . 7

**UNIT - II**

4. (a) Compare and contrast linear sort with count sort algorithm and compute their time complexity. 6.5
- (b) State the Master theorem of recurrence to determine time complexity of an algorithm that can be solved using Divide and Conquer. 6
5. (a) Examine Divide and Conquer paradigm of problem solving. 5
- (b) For the Pattern P = "ababababca" prepare the index table for shifting using the pre-processing algorithm of Knuth Morris Pratt Algorithm of string matching. 7.5