PG/IS/COS/101/23

M.Sc. 1st Semester Examination, 2023

COMPUTER SCIENCE

(*Analysis of Algorithm*)

PAPER – COS-101

Full Marks : 50

Time : 2 hours

Answer **all** questions

The figures in the right hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

GROUP – A

Answer any **four** questions : 2×4

1. What are the important features of an algorithm ?

2. Why are asymptotic notations used in algorithms.

3. What do you mean by tail-recursion ?

4. Why are the worst-case time complexities of quicksort and merge sort different ?

5. What are the key features of an optimization problem for which it can be implemented using dynamic programming ?

6. What is the need for approximation algorithm ?

GROUP – B

Answer any **four** of the following questions : 4×4

7. Write down the Quicksort algorithm using divide and conquer strategy. 4

8. What do you mean by dynamic programming approach ? How is it different from greedy approach ? 2 + 2

9. Briefly explain the role of backtracking in algorithm using an example. 4

10. Derive the minimum number of multiplications required to solve the following matrix chain multiplication M1, M2, M3, M4 matrices using dynamic programming approach : 4
$M1_{2\times2}\ M2_{2\times4}\ M3_{4\times3}\ M4_{3\times5}$.

11. Briefly explain how to derive all pair shortest path of a graph by Floyd - Warshall algorithm with dynamic programming approach using a suitable graph of at least 4 nodes. 4

12. Write down Kruskal's algorithm to find minimum spanning tree in a given graph. 4

GROUP – C

Answer any **two** of the following questions : 8×2

13. What do you mean by NP Hard and NP Complete problems ? Discuss the lower bound theory in context of algorithm. $4 + 4$

14. What do you mean by performance guarantee of an approximation algorithm. Briefly explain union find algorithm with a suitable example. $4 + 4$

15. Discuss DES and AES algorithms in cryptography. $2 + 6$

16. What do you mean by branch and bound theory in algorithm ? Briefly explain how 15-puzzle is solved using branch and bound theory. $2 + 6$

[Internal Assessment – 10 Marks]