Paper Name: Algorithms and Complexity Theory

Session: March 2022 to June 2022 Semester: 2

Paper Code: CSC-2026 LTP-420

Day	Unit	Topics
1	I	Concepts in algorithm analysis, time and space complexity.
2	I	Asymptotic notations (O, o) used for time complexity - I
3	I	Asymptotic notations (ω, Ω) used for time complexity - II
4	I	Asymptotic notations (θ) used for time complexity - III
5	I	Common Mathematical functions monotonicity, floors and ceilings, polynomials. Asymptotic behaviour of polynomials
6	I	Common Mathematical functions exponentials, logarithms, factorials and their relations using asymptotic behaviour.
7	I	Iterated logarithmic functions and relations with other functions.
8	I	Relational properties of asymptotic notations
9	I	Relative asymptotic growth, ordering functions by asymptotic growth rates.
10	I	Recurrences - substitution method
11	I	Recurrences – iteration method (using recursion tree).
12	I	Recurrences - using Master theorem
13	I	Introduction to the concept of amortized analysis. Use of aggregate method to some simple problems like stack operations.
14	I	Use of aggregate method to some simple problems like incrementing binary counter
15	II	Algorithm design technique – Divide and Conquer with illustrations - I
16		Algorithm design technique – Divide and Conquer with illustrations - II
17	II	Algorithm design technique – Dynamic programming with illustrations - I
18		Algorithm design technique – Dynamic programming with illustrations - II
19	II	Algorithm design technique – Greedy Algorithm with illustrations - I
20		Algorithm design technique – Greedy Algorithm with illustrations - II
21	II	Algorithm design technique - Back-tracking with illustrations
22	II	Algorithm design technique - Branch and Bound with illustrations
23	II	Dynamic storage allocation, garbage collection.

24	III	Representation of graphs – adjacency matrix and adjacency list.
25	III	Depth-first search with illustrations, properties, algorithm and complexity - I
26	III	Depth-first search with illustrations, properties, algorithm and complexity - II
27	III	Breadth-first search with illustrations, properties, algorithm and complexity-I
28	III	Breadth-first search with illustrations, properties, algorithm and complexity-II
29	III	Topological sort with illustrations, algorithm and complexity.
30	III	Minimum spanning tree – Definitions and Theorems.
31	III	Minimum spanning tree – Kruskal's algorithm
32	III	Minimum spanning tree – Prim's algorithm
33	III	Minimum spanning tree –Analysis and Comparison of Kruskal's and Prim's algorithm .
34	III	Single source shortest path problem and algorithm due to Dijkstra
35	III	Algorithm due to Dijkstra (continued) and analysis
36	IV	Decision Problem and Formal language framework
37	IV	Complexity classes – P, NP. co-NP - I .
38		Complexity classes – P, NP. co-NP - II
39	IV	Reducibility and NP-Completeness, NP-Hard
40		Theorems related to NP-Completeness - I
41	IV	Theorems related to NP-Completeness - II
42	V	Computing lower bounds for sorting
43	V	Computing lower bounds for merging.
44	V	Computing lower bounds for finding maximum and second maximum
45		Basic idea about neural network.
46		Neural network
47		Basic idea of genetic algorithm
48		Genetic algorithm