Code No.: MCA 202 **L T C**
Paper: Design and Analysis of Algorithms **3 1 4**

INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks including subparts, if any.

OBJECTIVE: *In this course, students will learn how:*

- *To design new algorithms based on standard algorithm-design strategies.*
- *To analyze the time and space usage and correctness of new algorithms based on standard algorithm-analysis techniques.*
- *To apply and adapt fundamental algorithms (sorting, searching, order statistics, graph algorithms) to new situations.*
- *To solve problems and to express your solutions using the language and concepts of algorithms and its mathematical tools.*

PRE-REQUISITES

- Programming in C
- Data Structure in C
- Discrete Mathematics

UNIT - I

Notion of Algorithm, Growth of functions, Summations, Recurrences: The substitution method, The iteration method, Asymptotic Notations and Basic Efficiency Classes. Use of Big O , θ, Ω in analysis .Mathematical Analysis of few Non-recursive and Recursive Algorithms , Proof of Correctness. **[No of Hrs.: 10]**

UNIT - II

Sorting and Searching Techniques , Selection Sort , Bubble Sort , Insertion Sort , Sequential Search Binary Search , Depth first Search and Breadth First Search. , Balanced Search trees , AVL Trees , Red-Black trees , Heaps and Heap sort , Hash Tables, disjoint set and their implementation , Divide and conquer Paradigm of Problem solving , complexity analysis and understanding of Merge sort , Quick Sort , Binary Search Trees, Sorting in linear time, Medians and Order statistics. **[No of Hrs.: 10]**

UNIT - III:

Greedy Techniques, Prim's Algorithm, Kruskal's Algorithm , Dijkstra's and Bellman Ford Algorithm , Huffman trees. Knapsack Problem , Dynamic Programming paradigm , Warshall 's and Floyd's Algorithm , Optimal Binary Search trees , Matrix multiplication Problem , 0/1 Knapsack Problem , maximum network flow problem , naive string matching algorithm , string matching with finite automata Knuth morris Pratt algorithm , The Rabin-Karp Algorithm.
[No of Hrs.: 10]

UNIT - IV

Backtracking, n-Queen's Problem, Hamiltonian Circuit problem, Subset-Sum problem, Branch and bound, Assignment problem, travelling salesman problem. Introduction to Computability, Polynomial-time verification, NP-Completeness and Reducibility, NP-Completeness Proof, NP-Complete problems, Proof of cook's theorem. **[No of Hrs.: 10]**

TEXT BOOKS

1. Jon Kleinberg and Eva Tardos, "Algorithm Design", Pearson Edition, 2006.
2. Richard Neapolitan and Kumarss Naimipour, "Foundations of Algorithms", Jones & Bartlett, 2004.
3. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, "Introduction to Algorithms" PHI, 3rd Ed., 2009.

REFERENCES:

1. Johnsonbaugh , "Algorithms", Pearson, 2004.
2. Anany Levitin, "Introduction to the Design and Analysis of Algorithm", Pearson Education, 2003.
3. Sara Baase and Allen Van Gelder, "Computer Algorithms - Introduction to Design and Analysis", Pearson Education, 2003.
4. A.V. Aho, J. E. Hopcroft and J.D.Ullman, "The Design and Analysis of Computer Algorithms", Pearson Education, 2003.
5. R. S. Salaria, Khanna, "Data Structure & Algorithms", Book Publishing Co. (P) Ltd., 2002.
6. R. Panneerselvam, "Design and Analysis of Algorithm", PHI, 2007.
7. Steven S. Skiena , "Algorithm Design Manual", Springer, 1998.
8. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, "Fundamental of Computer Algorithms", OrientLongman , 2006.