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Nota di contenuto	Cover; Title Page; Copyright; Contents; Preface; PART I: Complexity of Combinatorial Optimization Problems; Chapter 1: Basic Concepts in Algorithms and Complexity Theory; 1.1. Algorithmic complexity; 1.2. Problem complexity; 1.3. The classes P, NP and NPO; 1.4. Karp and Turing reductions; 1.5. NP-completeness; 1.6. Two examples of NP-complete problems; 1.6.1. MIN VERTEX COVER; 1.6.2. MAX STABLE; 1.7. A few words on strong and weak NP-completeness; 1.8. A few other well-known complexity classes; 1.9. Bibliography; Chapter 2: Randomized Complexity; 2.1. Deterministic and probabilistic algorithms 2.1.1. Complexity of a Las Vegas algorithm 2.1.2. Probabilistic complexity of a problem; 2.2. Lower bound technique; 2.2.1. Definitions and notations; 2.2.2. Minimax theorem; 2.2.3. The Loomis lemma and the Yao principle; 2.3. Elementary intersection problem; 2.3.1. Upper bound; 2.3.2. Lower bound; 2.3.3. Probabilistic complexity; 2.4. Conclusion; 2.5. Bibliography; PART II: Classical Solution Methods; Chapter 3: Branch-and-Bound Methods; 3.1. Introduction; 3.2. Branch-and-bound method principles; 3.2.1. Principle of separation; 3.2.2. Pruning principles; 3.2.2.1. Bound

3.2.2.2. Evaluation function; 3.2.2.3. Use of the bound and of the evaluation function for pruning; 3.2.2.4. Other pruning principles; 3.2.2.5. Pruning order; 3.2.3. Developing the tree; 3.2.3.1. Description of development strategies; 3.2.3.2. Compared properties of the depth first and best first strategies; 3.3. A detailed example: the binary knapsack problem; 3.3.1. Calculating the initial bound; 3.3.2. First principle of separation; 3.3.3. Pruning without evaluation; 3.3.4. Evaluation; 3.3.5. Complete execution of the branch-and-bound method for finding only one optimal solution; 3.3.6. First variant: finding all the optimal solutions; 3.3.7. Second variant: best first search strategy; 3.3.8. Third variant: second principle of separation; 3.4. Conclusion; 3.5. Bibliography; Chapter 4: Dynamic Programming; 4.1. Introduction; 4.2. A first example: crossing the bridge; 4.3. Formalization; 4.3.1. State space, decision set, transition function; 4.3.2. Feasible policies, comparison relationships and objectives; 4.4. Some other examples; 4.4.1. Stock management; 4.4.2. Shortest path bottleneck in a graph; 4.4.3. Knapsack problem; 4.5. Solution; 4.5.1. Forward procedure; 4.5.2. Backward procedure; 4.5.3. Principles of optimality and monotonicity; 4.6. Solution of the examples; 4.6.1. Stock management; 4.6.2. Shortest path bottleneck; 4.6.3. Knapsack; 4.7. A few extensions; 4.7.1. Partial order and multicriteria optimization; 4.7.1.1. New formulation of the problem; 4.7.1.2. Solution; 4.7.1.3. Examples; 4.7.2. Dynamic programming with variables; 4.7.2.1. Sequential decision problems under uncertainty; 4.7.2.2. Solution; 4.7.2.3. Example; 4.7.3. Generalized dynamic programming; 4.8. Conclusion; 4.9. Bibliography; PART III: Elements from Mathematical Programming; Chapter 5: Mixed Integer Linear Programming Models for Combinatorial Optimization Problems

Sommario/riassunto

Combinatorial optimization is a multidisciplinary scientific area, lying in the interface of three major scientific domains: mathematics, theoretical computer science and management. The three volumes of the Combinatorial Optimization series aim to cover a wide range of topics in this area. These topics also deal with fundamental notions and approaches as with several classical applications of combinatorial optimization. Concepts of Combinatorial Optimization, is divided into three parts: - On the complexity of combinatorial optimization problems, presenting basics about worst-case and randomi