INDEX

Index

 $\epsilon\text{-approximation algorithm},\,68$ 20PT, 70

acyclic, 39 affine transformation, 25 algorithm, 19 all pay sealed-bid auction, 97 approximation algorithms, 65 arcs, 39 artificial variables, 13 ascending price auction, 97 assignment problem, 45

bargaining set, 83 basic, 8 basic feasible solution, 8, 9 basic solution, 8, 9, 40 basis, 8, 9 Bellman's equations, 49 bidder participation, 98 bipartite graph, 43 Branch and Bound, 58

characteristic function, 85 circulation, 42 coalition, 85 coalitions, 85 common value, 97 complementary slackness conditions, 7connected, 39 convex function, 5 convex set, 5 cooperation, 79 core, 86 cost, 39 Cournot equilibrium, 92 cutset formulation of the TSP, 65 cycle, 39

Dakin's method, 61

Dijkstra's algorithm, 51 directed graph, 39 dominates, 76, 86 dual problem, 2, 7 dual simplex algorithm, 16 dummy variable, 36 duopoly, 91 Dutch auction, 97 dynamic programming, 49

ellipsoid, 25 ellipsoid method, 25, 35 English auction, 97 envelope theorem, 99 equilibrium pair, 77, 79 evolutionary stable strategy, 95 exact algorithms, 65 exponential time, 19 extreme point, 5

facility location problem, 64 feasible, 1 feasible spanning tree solution, 40 first price sealed-bid, 97 follower, 93 Ford-Fulkerson algorithm, 53 full-dimensional, 32

Game theory, 73 genetic algorithms, 72 Gomory's cutting plane method, 18 graph, 39

heuristic algorithms, 65 Hirsch conjecture, 24 Hitchcock transportation problem, 44

imputation, 85 instance, 19 instance size, 19 integer linear program, 57

jointly dominated, 82

knapsack problem, 63

label-correcting algorithms, 47 label-setting algorithms, 47 labels, 47 Lagrangian, 1, 7, 41 Lagrangian multiplier, 1 leader, 93 linear programming relaxation, 61 lower value, 74 LP-relaxation, 45

maximin bargaining solution, 84 maximin criterion, 74 minimum cost flow, 40 minimum cost flow problem, 39 mixed integer program, 61

Nash's bargaining axioms, 83 Nash's bargaining game, 82 neighbourhood search, 69 network, 39 nodes, 39 non-basic, 8 non-degenerate, 8 nondeterministic polynomial, 20 normal form representation, 73 nucleolus, 88

oligopoly, 91

Pareto optimal, 82 path, 39 perfect information, 73 pivot, 11 pivot column, 11 pivot row, 11 polynomial reduction, 21 polynomial time, 19 prices, 7 primal problem, 2 private value, 97 projective algorithm, 35 pure integer program, 61 pure strategies, 73, 74 purify, 38

reduced costs, 41 running time, 19

saddle point solution, 74 second price sealed bid, 97 shadow prices, 7 Shapley values, 89 sink, 39 solution, 75 source, 39 spanning tree, 39 spanning tree solution, 40 Stackleberg, 93 Strong Lagrangian, 2, 3 subnetwork. 39 subtour elimination formulation of the TSP. 66 superadditivity, 85 supporting hyperplane, 3 symmetric independent private values model. 98

tableau, 10 time complexity, 19 travelling salesman problem, 65 tree, 39

uncapacitated flows, 40 undirected graph, 39 upper value, 74

value, 75 Vickrey auction, 97 volume, 25 walk, 39 weak duality theorem, 2 winner's curse, 97 worst-case, 19

zero-one programs, 63 zero-sum, 73