

Contents

1	Introduction	1
1.1	Overview	1
1.2	Objective	5
1.3	Structure	5
2	Airline Scheduling Process	7
2.1	Introduction	7
2.1.1	Airline Scheduling	7
2.1.2	Outline	10
2.2	Flight Schedule Generation	12
2.2.1	Problem	12
2.2.2	Solution Models	16
2.3	Aircraft Scheduling	18
2.3.1	Problem	18
2.3.2	Solution Models	22
2.4	Crew Scheduling	25
2.4.1	Problem	25
2.4.2	Solution Models	29
2.5	Integrated Models	34
2.5.1	Overview	34
2.5.2	Models	35
2.6	Summary, Conclusion, and Future Challenges	42
2.6.1	Summary	42
2.6.2	Conclusion	44
2.6.3	Future Challenges	45
3	Foundations of Metaheuristics	47
3.1	Introduction	47
3.2	Metaheuristic Optimization	48

3.3	Design Elements of Metaheuristics	49
3.3.1	Solution Representation and Variation Operators	50
3.3.2	Fitness Function	51
3.3.3	Initialization	52
3.3.4	Search Strategy	52
3.4	Selected Metaheuristic Optimization Techniques	53
3.4.1	Local Search: Threshold Accepting	53
3.4.2	Recombination-Based Search: Genetic Algorithms	54
3.5	Summary	57
4	Integrated Airline Scheduling	59
4.1	Introduction	59
4.1.1	Motivation	59
4.1.2	Structure	61
4.1.3	Data	61
4.2	Schedule Evaluation	66
4.2.1	Overview	66
4.2.2	Market Size Estimation	68
4.2.3	Itinerary Construction	77
4.2.4	Itinerary Market Share Estimation	84
4.2.5	Passenger Allocation	95
4.2.6	Profit Estimation	97
4.2.7	Summary	97
4.3	Sequential Approach	99
4.3.1	Overview	99
4.3.2	Solution Steps	100
4.3.3	Solution Process	113
4.3.4	Experiments	118
4.3.5	Summary and Conclusion	126
4.4	Simultaneous Approach	129
4.4.1	Overview	129
4.4.2	Conceptual Design	129
4.4.3	Experiments	141
4.4.4	Summary and Conclusion	155
4.5	Evaluation	156
4.5.1	Comparison	157
4.5.2	Experimental Verification	161
4.5.3	Summary	166
4.6	Summary, Conclusion, Limitations, and Future Work	167
4.6.1	Summary	167
4.6.2	Conclusion	168
4.6.3	Limitations	169
4.6.4	Future Work	170

Contents	IX
5 Summary, Conclusions, and Future Work	173
5.1 Summary	173
5.2 Conclusion	175
5.3 Future Work	175
A Aircraft Data	177
B Experimental Setups	179
B.1 Scenario A	180
B.2 Scenario B	180
B.3 Scenario C	180
B.4 Scenario D	180
B.5 Scenario E	181
C Experimental Results	183
C.1 Calibration	184
C.1.1 Sequential Approach	184
C.1.2 Simultaneous Approach	190
C.2 Analysis	199
C.2.1 Sequential Approach	199
C.2.2 Simultaneous Approach	211
C.3 Evaluation	228
References	231
Glossary	249