

Contents

1	The Subject Domain of System Analysis	1
1.1	Formation and Development of System Analysis	1
1.2	Place and Role of System Analysis in Human Practical Activities	23
1.3	System Analysis as an Applied Scientific Methodology	28
2	Basic Notions of System Analysis	35
2.1	Objects of System Analysis	35
2.2	Properties of System Problems and System Methodology	43
2.3	Classification of System Analysis Problems and Procedures	55
2.4	Notions of Complexity of System Problems, Complexity Spectrums, Transcomputational Complexity	64
2.5	Principles of Overcoming the Transcomputational Complexity of System Problems	73
3	Disclosing Uncertainties in System Analysis Problems	85
3.1	Problems and Methods of Disclosing Goal Uncertainty	85
3.2	Disclosure of Situation Uncertainty	101
3.3	Disclosing the Uncertainty of Partners' or Opponents' Actions	105
3.4	Uncertainty Disclosure in Problems of Strategies Conflict	111
3.5	Problems and Methods of System Uncertainty Disclosure	118
3.6	Recovery of Functional Dependences in Conceptual Uncertainty Disclosure Problems	131
3.7	System Coordination of Contradictory Goals in the Search for Rational Compromises	150
4	Disclosing Uncertainties in Problems of Interaction and Counteraction of Coalitions	159
4.1	Mathematical Statement of Problem	159
4.2	General Strategy for Solving Problems of System Interactions or Counteractions of Coalitions	168
4.3	Formalization of Coalition Counteraction Strategy	171
4.4	Formalization of Risks in Problems of Coalitions' System Interaction or Counteraction	178

4.5	Methods and an Example of Coalition Interaction and Counteraction Problem Solving	183
5	Information Analysis of System Problems	201
5.1	Analysis of Quantitative and Qualitative Characteristics of Information	201
5.2	Formalization of Characteristics and Indicators of a Decision Maker's Informedness	207
5.3	Classification and Recognition of Situations Through Integral and Partial Indicators	219
5.4	Recognition of Situations in Conditions of Information Fuzziness	228
5.5	Determining the Permissible Time for Generating and Realizing Decisions to Prevent Catastrophic Situations: Example	241
6	Structural-Functional Analysis of Complex Hierarchical Systems	247
6.1	Basic Properties and Features of Complex Hierarchical Systems	248
6.2	Formalization of Structural-Functional Analysis Problem	253
6.3	General Strategy for Solving the Problem of Structural-Functional Analysis	259
6.4	System Optimization of Complex Constructive Elements of Modern Equipment	273
6.5	Choice of a Rational Structure of a Personal Computer	284
7	Problems and Methods of System Analysis of Multifactor Risks	289
7.1	General Problem of System Analysis of Multifactor Risks	289
7.2	Properties and Peculiarities of Complex Engineering Systems Operating Under Conditions of Multifactor Risks	299
7.3	Analysis of Multifactor Risks of Accidents and Catastrophes .	305
7.4	Basic Principles and Peculiarities of Control of Complex-system Safety	311
7.5	Example of Solving System Analysis Problems of Multifactor Risks	319
8	System Control of Complex Objects	329
8.1	System Control Problem Analysis and Classification	329
8.2	System Control Problems of Complex Objects' Operational Capability and Safety	338
8.3	System Control of Complex-Object Structure and Properties .	348
8.4	Technical-Economical Analysis of Complex Object System Control	356

8.5	Example of Solving a Problem of System Control of Serviceability and Safety of a Complex Engineering Object	361
9	Foresight System Methodology	371
9.1	Foresight Importance and Objectives	371
9.2	Scenario Analysis as a Basic Foresight Methodology	375
9.3	General Procedure of Expert Estimation in Technology Foresight Problems	386
9.4	Scenario Analysis Information Platform	390
9.5	Role of Technology Foresight System Strategy in Innovation	396
9.6	An Example of the Foresight Problem Solution for Multicriterion Estimation of Innovation Objects	406
	References	429
	Index	441



<http://www.springer.com/978-3-540-48879-8>

System Analysis: Theory and Applications

Zgurovsky, M.; Pankratova, N.D.

2007, XXII, 447 p., Hardcover

ISBN: 978-3-540-48879-8