INTERNATIONAL EDITION

systems analysis and design

KENDALL & KENDALL

PART I SYSTEMS ANALYSIS FUNDAMENTALS

1 ASSUMING THE ROLE OF THE SYSTEMS ANALYST 1

Types of Systems 2

Transaction Processing Systems 2 / Office Automation Systems and Knowledge Work Systems 3 / Management Information Systems 3 / Decision Support Systems 3 / Expert Systems and Artificial Intelligence 3 / Group Decision Support Systems and Computer-Supported Collaborative Work Systems 4 / Executive Support Systems 4

Integrating Technologies for Systems 4

Ecommerce Applications and Web Systems 4 / Enterprise Resource Planning Systems 5 / Systems for Wireless and Handheld Devices 5 / Open Source Software 6

Need for Systems Analysis and Design 6

Roles of the Systems Analyst 7

Systems Analyst as Consultant 8 / Systems Analyst as Supporting Expert 8

Consulting Opportunity 1.1 Healthy Hiring: Ecommerce Help Wanted 8 Systems Analyst as Agent of Change 9 / Qualities of the Systems Analyst 9

The Systems Development Life Cycle 10

Identifying Problems, Opportunities, and Objectives 10 / Determining Information Requirements 11 / Analyzing System Needs 11 / Designing the Recommended System 12 / Developing and Documenting Software 12 / Testing and Maintaining the System 13 / Implementing and Evaluating the System 13 / The Impact of Maintenance 13

Using CASE Tools 14

Reasons for Using CASE Tools 15

Upper and Lower CASE 16

Upper CASE Tools 16 / Lower CASE Tools 16

Software Reverse Engineering and Reengineering 18

Object-Oriented Systems Analysis and Design 19

Extreme Programming and Other Alternative Methodologies 20 SUMMARY 20

HYPERCASE® EXPERIENCE 1 21

KEYWORDS AND PHRASES 22

REVIEW QUESTIONS 23

SELECTED BIBLIOGRAPHY 23

CPU CASE EPISODE 1: THE CASE OPENS 25

UNDERSTANDING ORGANIZATIONAL STYLE AND ITS IMPACT ON INFORMATION SYSTEMS 27

Organizations as Systems 27

Interrelatedness and Interdependence of Systems 28 / Virtual Organizations and Virtual Teams 29 / Taking a Systems Perspective 30

Consulting Opportunity 2.1 The E in Vitamin E Stands

for Ecommerce 30 Enterprise Resource Planning: Viewing the Organization as a System 32

Depicting Systems Graphically 32 Systems and the Context-Level Data Flow Diagram 32 / Systems and the Entity-Relationship Model 33

Levels of Management 39 Implications for Information Systems Development 40

Consulting Opportunity 2.2 Where There's Carbon, There's a Copy 40

Organizational Culture 41

Consulting Opportunity 2.3 Pyramid Power 41 SUMMARY 42

HYPERCASE® EXPERIENCE 2 43

KEYWORDS AND PHRASES 44

REVIEW QUESTIONS 44

PROBLEMS 45 GROUP PROJECTS 46

Project Initiation 49

SELECTED BIBLIOGRAPHY 46 CPU CASE EPISODE 2: PICTURING THE RELATIONSHIPS 47

3 DETERMINING FEASIBILITY AND MANAGING ANALYSIS AND DESIGN ACTIVITIES 49

Problems in the Organization 50 / Selection of Projects 51 Consulting Opportunity 3.1 The Sweetest Sound I've Ever Sipped 51

Determining Feasibility 52 Defining Objectives 53 / Determining Resources 55 / Judging

Feasibility 57

Activity Planning and Control 57 Estimating Time Required 57

Consulting Opportunity 3.2 Food For Thought 58

Using Gantt Charts for Project Scheduling 59 / Using PERT Diagrams 60

Computer-Based Project Scheduling 63

Timeboxing 64

Managing Analysis and Design Activities 64 Communication Strategies for Managing Teams 65 / Setting Project Productivity

Goals 65 / Motivating Project Team Members 66

Consulting Opportunity 3.3 Goal Tending 66

Managing Projects Using COTS Software 67 / Managing Ecommerce Projects 67 / Avoiding Project Failures 68

Extreme Programming Projects 68

Extreme Programming Resource Trade-Offs 69 / Extreme Programming Core Practices and Roles 72 / Developmental Process for an XP Project 77

SHMMARY 78

HYPERCASE® EXPERIENCE 3 79

KEYWORDS AND PHRASES 81

REVIEW QUESTIONS 81

PROBLEMS 82

GROUP PROJECTS 84

SELECTED BIBLIOGRAPHY 84

CPU CASE EPISODE 3: GETTING TO KNOW U 85

PART II INFORMATION REQUIREMENTS ANALYSIS

4 INFORMATION GATHERING: INTERACTIVE METHODS 89

Interviewing 89

Five Steps in Interview Preparation 90 / Question Types 91 / Arranging

Questions in a Logical Sequence 94

Consulting Opportunity 4.1 Strengthening Your Question Types 95

Writing the Interview Report 97

Consulting Opportunity 4.2 Skimming the Surface 97

Joint Application Design 97

HYPERCASE® EXPERIENCE 4.1 98

Conditions that Support the Use of JAD 99 / Who Is Involved 99 / Where to Hold JAD Meetings 99 / Accomplishing a Structured Analysis of Project Activities 100 / Potential Benefits of Using JAD in Place of Traditional Interviewing 100

Consulting Opportunity 4.3 A Systems Analyst, I Presume? 100

Potential Drawbacks of Using JAD 101

Using Questionnaires 101

Planning for the Use of Questionnaires 102 / Writing Questions 102 / Using Scales in Questionnaires 106 / Designing the Questionnaires 107

Consulting Opportunity 4.4 The Unbearable Questionnaire 108

Administering Questionnaires 109

Consulting Opportunity 4.5 Order in the Courts 110

SUMMARY 111

HYPERCASE® EXPERIENCE 4.2 112

KEYWORDS AND PHRASES 113

REVIEW QUESTIONS 113

PROBLEMS 114

GROUP PROJECTS 117

SELECTED BIBLIOGRAPHY 118

CPU CASE EPISODE 4: I'LL LISTEN NOW, ASK QUESTIONS LATER 119

5 INFORMATION GATHERING: UNOBTRUSIVE METHODS 123

Sampling 123

The Need for Sampling 124 / Sampling Design 124 / The Sample

Size Decision 126

Consulting Opportunity 5.1 Trapping a Sample 128

Investigation 128

Analyzing Quantitative Documents 129

Consulting Opportunity 5.2 A Rose by Any Other Name . . . or Quality,

Not Quantities 131

Analyzing Qualitative Documents 132

HYPERCASE® EXPERIENCE 5.1 135

Observing a Decision Maker's Behavior 135

Observing a Typical Manager's Decision-Making Activities 135

Observing the Physical Environment 137

Structured Observation of the Environment (STROBE) 137 /

Applying STROBE 139

Consulting Opportunity 5.3 Don't Bank on Their Self-Image or Not Everything Is Reflected in a Mirror 140

SUMMARY 142

HYPERCASE® EXPERIENCE 5.2 143

KEYWORDS AND PHRASES 144

REVIEW QUESTIONS 144

PROBLEMS 145

GROUP PROJECTS 147
SELECTED BIBLIOGRAPHY 148

CPU CASE EPISODE 5: SEFING IS BELIEVING 149

6 PROTOTYPING, RAD, AND EXTREME PROGRAMMING 151

Prototyping 151

Kinds of Prototypes 152 / Prototyping as an Alternative to the Systems Development Life Cycle 154

Developing a Prototype 155

Guidelines for Developing a Prototype 156 / Disadvantages of Prototyping 157 / Advantages of Prototyping 157

Consulting Opportunity 6.1 Is Prototyping King? 157

Prototyping Using COTS Software 158

Consulting Opportunity 6.2 Clearing the Way for Customer Links 158

Consulting Opportunity 6.3 To Hatch a Fish 159

Users' Role in Prototyping 159

Interaction with the Prototype 159

Consulting Opportunity 6.4 This Prototype Is All Wet 160

Rapid Application Development 161

Phases of RAD 161 / Comparing RAD to the SDLC 163

Extreme Programming 165

Values and Principles of Extreme Programming 165 / Extreme

Programming Activities, Resources, and Practices 168 / The XP Development Process and Tools 171 / Lessons Learned from XP 175 / Agile Modeling

and Scrum 176

SUMMARY 177

HYPERCASE® EXPERIENCE 6 179

KEYWORDS AND PHRASES 180

REVIEW QUESTIONS 180

PROBLEMS 181

GROUP PROJECTS 182

SELECTED BIBLIOGRAPHY 183

CPU CASE EPISODE 6: REACTION TIME 184

PART III THE ANALYSIS PROCESS

7 USING DATA FLOW DIAGRAMS 191

The Data Flow Approach to Requirements Determination 191

Advantages of the Data Flow Approach 192 / Conventions Used in Data Flow Diagrams 192

Developing Data Flow Diagrams 194

Creating the Context Diagram 194 / Drawing Diagram 0 (The Next Level) 195 / Creating Child Diagrams (More Detailed Levels) 195 / Checking the Diagrams for Errors 197

Logical and Physical Data Flow Diagrams 199

Developing Logical Data Flow Diagrams 201 / Developing Physical Data Flow Diagrams 202 $\,$

Partitioning Data Flow Diagrams 207

A Data Flow Diagram Example 208

Creating the Context Diagram 209 / Drawing Diagram 0 209 / Creating a Child Diagram 211

Creating a Physical Data Flow Diagram 212

Partitioning the Data Flow Diagram 214

A Second Data Flow Diagram Example 215

Partitioning Web Sites 221

Communicating Using Data Flow Diagrams 222

Consulting Opportunity 7.1 There's No Business Like Flow Business 223 SUMMARY 224

HYPERCASE® EXPERIENCE 7 225

KEYWORDS AND PHRASES 225

REVIEW QUESTIONS 226

PROBLEMS 226

GROUP PROJECTS 228

SELECTED BIBLIOGRAPHY 229

CPU CASE EPISODE 7: JUST FLOWING ALONG 230

8 ANALYZING SYSTEMS USING DATA DICTIONARIES 245

The Data Dictionary 245

Need for Understanding the Data Dictionary 246

The Data Repository 246

Defining the Data Flows 247 / Describing Data Structures 249 / Logical and Physical Data Structures 251 / Data Elements 252 / Data Stores 257

Creating the Data Dictionary 259

Analyzing Input and Output 260 / Developing Data Stores 261

Consulting Opportunity 8.1 Want to Make It Big in the Theatre? Improve Your Diction(ary)! 261

Using the Data Dictionary 262

Using Data Dictionaries to Create XML 264

SUMMARY 266

HYPERCASE® EXPERIENCE 8 267

KEYWORDS AND PHRASES 268 REVIEW QUESTIONS 268

PROBLEMS 268 GROUP PROJECTS 271

SELECTED BIBLIOGRAPHY 271

CPU CASE EPISODE 8: DEFINING WHAT YOU MEAN 272

DESCRIBING PROCESS SPECIFICATIONS AND STRUCTURED DECISIONS 283

Overview of Process Specifications 283

Process Specification Format 284

Structured English 286

Writing Structured English 287

Consulting Opportunity 9.1 Kit Chen Kaboodle, Inc. 288

Consulting Opportunity 9.2 Kneading Structure 289

Data Dictionary and Process Specifications 290

Decision Tables 292

Developing Decision Tables 293

Consulting Opportunity 9.3 Saving a Cent on Citron Car Rental 295 Checking for Completeness and Accuracy 296 / More Advanced Decision

Tables 297

Decision Trees 299

Drawing Decision Trees 299

Consulting Opportunity 9.4 A Tree for Free 300

Choosing a Structured Decision Analysis Technique 301

Physical and Logical Process Specifications 303

Using Process Specifications: Horizontal Balancing 304

SUMMARY 307

HYPERCASE® EXPERIENCE 9 308

KEYWORDS AND PHRASES 309

REVIEW QUESTIONS 309

REVIEW QUESTIONS 309

PROBLEMS 310

GROUP PROJECTS 311

SELECTED BIBLIOGRAPHY 312

CPU CASE EPISODE 9: TABLING A DECISION 313

10 PREPARING THE SYSTEMS PROPOSAL 319

Ascertaining Hardware and Software Needs 319

Inventorying Computer Hardware 320 / Estimating Workloads 321 / Evaluating Computer Hardware 322 / Acquisition of Computer Equipment 322 / Software Evaluation 325 / Decision Support Tools 328 / Expert Systems, Neural Nets, and Other Decision Tools 329

Consulting Opportunity 10.1 Veni, Vidi, Vendi, or, I Carne, I Saw, I Sold 329 HYPERCASE® EXPERIENCE 10.1 331

Identifying and Forecasting Costs and Benefits 331

Forecasting Costs and Benefits 331 / Identifying Benefits and Costs 333

Consulting Opportunity 10.2 We're Off to See the Wizards 334

Comparing Costs and Benefits 335

Break-Even Analysis 335 / Cash-Flow Analysis 336 / Present Value Analysis 337

HYPERCASE® EXPERIENCE 10.2 337

Guidelines for Analysis 339 / Examining Alternative Systems 339

The Systems Proposal 340

Organizing the Systems Proposal 340 / Using Figures for Effective Communication 341

Presenting the Systems Proposal 346

Understanding the Audience 346 / Organizing the Systems Proposal Presentation 346

Consulting Opportunity 10.3 Should This Chart Be Barred? 347

Principles of Delivery 348

SHMMARY 348

HYPERCASE® EXPERIENCE 10.3 349

KEYWORDS AND PHRASES 350

REVIEW QUESTIONS 350

PROBLEMS 351

SELECTED BIBLIOGRAPHY 354

CPU CASE EPISODE 10: PROPOSING TO GO FORTH 356

PART IV THE ESSENTIALS OF DESIGN

11 DESIGNING EFFECTIVE OUTPUT 359

Output Design Objectives 359

Designing Output to Serve the Intended Purpose 360 / Designing Output to Fit the User 360 / Delivering the Appropriate Quantity of Output 360 / Making Sure the Output Is Where It Is Needed 360 / Providing the Output on Time 360 / Choosing the Right Output Method 361

Relating Output Content to Output Method 361

Output Technologies 361

Consulting Opportunity 11.1 Your Cage or Mine? 365

Factors to Consider When Choosing Output Technology 368

Consulting Opportunity 11.2 A Right Way, a Wrong Way, and a Subway 372

Realizing How Output Bias Affects Users 373

Recognizing Bias in the Way Output Is Used 373 / Avoiding Bias in the Design of Output 374

Designing Printed Output 374

Guidelines for Printed Report Design 375

Consulting Opportunity 11.3 Is Your Work a Grind? 376

Designing Output for Displays 377

Guidelines for Display Design 377 / Using Graphical Output in Screen Design 378.

Designing a Web Site 379

General Guidelines for Designing Web Sites 380

Output Production and XML 387

Consulting Opportunity 11.4 A Field Day 388

SUMMARY 389

KEYWORDS AND PHRASES 389

REVIEW QUESTIONS, 389 HYPERCASE® EXPERIENCE 11 390

PROBLEMS 391

GROUP PROJECTS 394 SELECTED BIBLIOGRAPHY 395

CPU CASE EPISODE 11: REPORTING ON OUTPUTS 396

12 DESIGNING EFFECTIVE INPUT 405

Good Form Design 405

Making Forms Easy to Fill In 406 / Meeting the Intended Purpose 409 / Ensuring Accurate Completion 409 / Keeping Forms Attractive 409 / Computer-Assisted Form Design 410

Consulting Opportunity 12.1 This Form May Be Hazardous to Your Health 411 Controlling Business Forms 413

Good Display and Web Forms Design 414

Keeping the Display Simple 414 / Keeping the Display Consistent 415 / Facilitating Movement 415 / Designing an Attractive Display 415

Consulting Opportunity 12.2 Squeezin' Isn't Pleasin' 417 Using Icons in Display Design 418 / Graphical User Interface Design 418

Consulting Opportunity 12.3 What's That Thing Supposed to Be? 420 Tab Control Dialog Boxes 421

Consulting Opportunity 12.4 It's Only Skin Deep 423

Using Color in Display Design 424

Intranet and Internet Page Design 424 SUMMARY 426

HYPERCASE® EXPERIENCE 12 427

KEYWORDS AND PHRASES 428

REVIEW QUESTIONS 428

PROBLEMS 429

GROUP PROJECTS 433

SELECTED BIBLIOGRAPHY 434

CPU CASE EPISODE 12: FORMING SCREENS AND SCREENING FORMS 435

13 DESIGNING DATABASES 443

Databases 444

Data Concepts 444

Consulting Opportunity 13.1 Hitch Your Cleaning Cart to a Star 445 Reality, Data, and Metadata 445 / File Organization 452 /

Relational Databases 454

Normalization 456

The Three Steps of Normalization 456 / A Normalization Example 457 / Using the Entity-Relationship Diagram to Determine Record Keys 466 / One-to-Many Relationship 466 / Many-to-Many Relationship 466

Guidelines for Master File/Database Relation Design 467 Integrity Constraints 468

Making Use of the Database 469

Steps in Retrieving and Presenting Data 469

Denormalization 474

Data Warehouses 475

Online Analytic Processing 477 / Data Mining 479

Publishing Databases to the Web 479

Consulting Opportunity 13.2 Storing Minerals for Health, Data for Mining 481

SUMMARY 482

HYPERCASE® EXPERIENCE 13 483

KEYWORDS AND PHRASES 483

REVIEW QUESTIONS 484

PROBLEMS 485

GROUP PROJECT 486

SELECTED BIBLIOGRAPHY 486

CPU CASE EPISODE 13: BACK TO DATA BASICS 487

14 DESIGNING USER INTERFACES 497

Types of User Interface 497

Natural-Language Interfaces 498 / Question-and-Answer Interfaces 498 /

Menus 499 / Form-Fill Interfaces (Input/Output Forms) 501

Consulting Opportunity 14.1 I'd Rather Do It Myself 501

Command-Language Interfaces 502 / Graphical User Interfaces 503

Consulting Opportunity 14.2 Don't Slow Me Down 503

Other User Interfaces 504

Consulting Opportunity 14.3 That's Not a Lightbulb 504

Guidelines for Dialog Design 506

Meaningful Communication 506 / Minimal User Action 507 /

Standard Operation and Consistency 508

Consulting Opportunity 14.4 Waiting to Be Fed 510

Feedback for Users 510

Types of Feedback 511 / Including Feedback in Design 513

Special Design Considerations for Ecommerce 514

Soliciting Feedback from Ecommerce Web Site Customers 514 / Easy Navigation for Ecommerce Web Sites 515

Consulting Opportunity 14.5 When You Run a Marathon, It Helps to Know Where You're Going 515

Designing Queries 516

Query Types 516 / Query Methods 519

Consulting Opportunity 14.6 Hey, Look Me Over (Reprise) 521

Searching the Web 524

Guidelines for Searching the Web 525

Data Mining 525

Consulting Opportunity 14.7 Losing Prospects 527

SUMMARY 527

HYPERCASE® EXPERIENCE 14 528

KEYWORDS AND PHRASES 529

REVIEW QUESTIONS 530
PROBLEMS 530
GROUP PROJECTS 531
SELECTED BIBLIOGRAPHY 532
CPU CASE EPISODE 14: UP TO THE USERS 533

15 DESIGNING ACCURATE DATA ENTRY PROCEDURES 543

Effective Coding 543

Keeping Track of Something 544 / Classifying Information 545 / Concealing Information 547 / Revealing Information 548 / Unicode 549 / Requesting Appropriate Action 550 / General Guidelines for Coding 550

Consulting Opportunity 15.1 It's a Wilderness in Here 551

Effective and Efficient Data Capture 553

Deciding What to Capture 553 / Letting the Computer Do the Rest 554

Consulting Opportunity 15.2 Catching a Summer Code 554

Avoiding Bottlenecks and Extra Steps 556 / Starting with a Good Form 556 / Choosing a Data Entry Method 557

Ensuring Data Quality through Input Validation 560

Validating Input Transactions 560 / Validating Input Data 561

Consulting Opportunity 15.3 To Enter or Not to Enter: That is the Question 562 The Process of Validation 566

Consulting Opportunity 15.4 Do You Validate Parking? 567

Accuracy Advantages in Ecommerce Environments 567

Customers Keying Their Own Data 567 / Storing Data for Later Use 567 / Using Data through the Order Fulfillment Process 568 / Providing Feedback to Customers 568

SHMMARY 568

HYPERCASE® EXPERIENCE 15 569

KEYWORDS AND PHRASES 570

REVIEW QUESTIONS 570

PROBLEMS 571

GROUP PROJECTS 574

SELECTED BIBLIOGRAPHY 574

CPU CASE EPISODE 15: ENTERING NATURALLY 575

PART V SOFTWARE ENGINEERING AND IMPLEMENTATION

16 QUALITY ASSURANCE THROUGH SOFTWARE ENGINEERING 581

The Total Quality Management Approach 581

Six Sigma 582 / Responsibility for Total Quality Management 582 / Structured Walkthrough 584

Consulting Opportunity 16.1 The Quality of MIS is Not Strained 584

Systems Design and Development 585 / Modular Development 587 / Modularity in the Windows Environment 588

Using Structure Charts to Design Systems 588

Drawing a Structure Chart 592 / Types of Modules 594 / Module Subordination 596

Software Engineering and Documentation 598

Pseudocode 599 / Procedure Manuals 600 / The FOLKLORE Method 601 /

Choosing a Design and Documentation Technique 603

Consulting Opportunity 16.2 Write Is Right 603

Testing, Maintenance, and Auditing 604

The Testing Process 604

Consulting Opportunity 16.3 Cramming for Your Systems Test 606

Maintenance Practices 607 / Auditing 607

SHMMARY 608

HYPERCASE® EXPERIENCE 16 609

KEYWORDS AND PHRASES 610

REVIEW QUESTIONS 610

PROBLEMS 611

GROUP PROJECTS 612

SELECTED BIBLIOGRAPHY 612

CPU CASE EPISODE 16: CHARTING THE STRUCTURE 613

17 SUCCESSFULLY IMPLEMENTING THE INFORMATION SYSTEM 621

Implementing Distributed Systems 622

Client/Server Technology 622 / Types of Distributed Systems Networks 624 / Network Modeling 626 / Groupware 630

Training Users 632

Training Strategies 633 / Guidelines for Training 634

Conversion 635

Consulting Opportunity 17.1 You Can Lead a Fish to Water . . . But You Can't

Make It Drink 635 Conversion Strategies 636

Security Concerns for Traditional and Web-Based Systems 637

Physical Security 638 / Logical Security 638 / Behavioral Security 639 / Special Security Considerations for Ecommerce 640

Other Conversion Considerations 641

Organizational Metaphors and Their Relationship to Successful Systems 641

Evaluation 642

Evaluation Techniques 642 / The Information System Utility Approach 643 / Evaluating the System 644

Consulting Opportunity 17.2 The Sweet Smell of Success 644

Evaluating Corporate Web Sites 645

Consulting Opportunity 17.3 Mopping Up with the New System 645 SUMMARY 648

KEYWORDS AND PHRASES 649

HYPERCASE® EXPERIENCE 17 649

REVIEW QUESTIONS 650

PROBLEMS 651

GROUP PROJECT 653

SELECTED BIBLIOGRAPHY 653

CPU CASE EPISODE 17: SEMPER REDUNDATE 655

18 OBJECT-ORIENTED SYSTEMS ANALYSIS AND DESIGN USING UMI 657

Object-Oriented Concepts 658

Objects 658 / Classes 658 / Inheritance 659

CRC Cards and Object Think 660

Interacting During a CRC Session 661

Consulting Opportunity 18.1 Making the Magic Reel 661

The Unified Modeling Language (UML) Concepts and Diagrams 663

Use Case Modeling 665

Use Case Symbols 666 / Use Case Relationships 666 / Developing Use Case Diagrams 668 / Developing Use Case Scenarios 669

Activity Diagrams 671

Creating Activity Diagrams 672

Consulting Opportunity 18.2 Recycling the Programming Environment 674

Sequence and Collaboration Diagrams 675

Sequence Diagrams 675 / Collaboration Diagrams 677

Class Diagrams 678

Method Overloading 680 / Types of Classes 680 / A Class Example for the Web 681 / Relationships 684 / Generalization/Specialization (Gen/Spec) Diagrams 687

Statechart Diagrams 691

State Transition Example 692

Packages and Other UML Artifacts 693

Putting the UML to Work 695

Consulting Opportunity 18.3 Developing a Fine System That Was Long Overdue: Using Object-Oriented Analysis for the Ruminski Public Library System 695

The Importance of Using the UML for Modeling 697

Consulting Opportunity 18.4 C-Shore++ 698

SUMMARY 699

KEYWORDS AND PHRASES 699

REVIEW QUESTIONS 700

PROBLEMS 701

SELECTED BIBLIOGRAPHY 701

GLOSSARY 703 ACRONYMS 713

INDEX 714