

Table of Contents

| | |
|---|--------------|
| <i>Preface</i> | <i>iii</i> |
| Outline of the Book | iii |
| Distinguishing Features | iii |
| Intended Readership | v |
| Organization of the Book | v |
| Supplementary Materials | vi |
| Acknowledgements | vii |
| <i>Book Activity Diagrams</i> | <i>xvii</i> |
| OnLine Shopping (Guided Tutorial) | xviii |
| University Enrolment (Case Study) | xx |
| Video Store (Case Study) | xxii |
| Contact Management (Case Study) | xxiii |
| Telemarketing (Case Study) | xxv |
| 1 Software Process | 1 |
| 1.1 The Nature of Software Development | 1 |
| 1.1.1 The Software Development Invariant..... | 3 |
| 1.1.2 Stakeholders | 4 |
| 1.1.3 Process..... | 6 |
| 1.1.3.1 Iterative and Incremental Process..... | 6 |
| 1.1.3.2 Capability Maturity Model..... | 7 |
| 1.1.3.3 ISO 9000 | 8 |
| 1.1.4 Modeling Language and Tools | 9 |
| 1.1.4.1 Unified Modeling Language | 10 |
| 1.1.4.2 CASE and Process Improvement | 11 |
| 1.2 System Planning | 11 |
| 1.2.1 SWOT Approach..... | 12 |
| 1.2.2 VCM Approach | 13 |
| 1.2.3 BPR Approach..... | 14 |
| 1.2.4 ISA Approach..... | 15 |
| 1.2.5 Systems for Three Management Levels | 16 |
| 1.3 Software Lifecycle Phases | 17 |
| 1.3.1 Requirements Phase..... | 19 |

| | | |
|------------|---|-----------|
| 1.3.2 | Specification Phase..... | 20 |
| 1.3.3 | Architectural Design Phase | 20 |
| 1.3.4 | Detailed Design Phase..... | 21 |
| 1.3.5 | Implementation Phase | 21 |
| 1.3.6 | Integration Phase | 22 |
| 1.3.7 | Maintenance Phase | 23 |
| 1.3.8 | Project Planning in Software Lifecycle | 24 |
| 1.3.9 | Metrics in Software Lifecycle | 25 |
| 1.3.10 | Testing in Software Lifecycle..... | 26 |
| 1.4 | Software Development Approaches..... | 27 |
| 1.4.1 | Structured Approach..... | 28 |
| 1.4.2 | Object-Oriented Approach | 29 |
| | Summary | 31 |
| | Review Questions..... | 32 |
| 2 | <i>Underpinnings of Requirements Analysis.....</i> | 34 |
| 2.1 | Fundamentals of Object Technology..... | 34 |
| 2.1.1 | Instance Object..... | 35 |
| 2.1.1.1 | Object Notation | 36 |
| 2.1.1.2 | How Objects Collaborate?..... | 36 |
| 2.1.1.3 | How Objects Identify Each Other?..... | 37 |
| 2.1.1.3.1 | Persistent Link..... | 38 |
| 2.1.1.3.2 | Transient Link | 39 |
| 2.1.2 | Class | 40 |
| 2.1.2.1 | Attribute | 41 |
| 2.1.2.1.1 | Attribute Type that Designates a Class..... | 41 |
| 2.1.2.1.2 | Attribute Visibility | 42 |
| 2.1.2.2 | Operation..... | 43 |
| 2.1.2.2.1 | Operations Support Object Collaboration | 43 |
| 2.1.2.2.2 | Operation Visibility and Scope | 44 |
| 2.1.3 | Association..... | 44 |
| 2.1.3.1 | Association Degree | 45 |
| 2.1.3.2 | Association Multiplicity | 45 |
| 2.1.3.3 | Association Link and Extent | 46 |
| 2.1.3.4 | Association Class | 47 |
| 2.1.4 | Aggregation and Composition..... | 48 |
| 2.1.5 | Generalization | 49 |
| 2.1.5.1 | Polymorphism | 50 |
| 2.1.5.2 | Inheritance..... | 51 |
| 2.1.5.2.1 | Multiple Inheritance | 51 |
| 2.1.5.2.2 | Multiple Classification | 52 |
| 2.1.5.2.3 | Dynamic Classification | 53 |
| 2.1.5.3 | Abstract class..... | 53 |
| 2.1.6 | Class Object..... | 54 |
| 2.2 | Guided Tutorial in Analysis Modeling..... | 55 |
| 2.2.1 | OnLine Shopping | 55 |
| 2.2.2 | Use Case Modeling..... | 56 |
| 2.2.2.1 | Actors | 57 |
| 2.2.2.2 | Use Cases | 58 |
| 2.2.2.3 | Use Case Diagram..... | 60 |
| 2.2.2.4 | Documenting Use Cases..... | 61 |
| 2.2.3 | Activity Modeling | 63 |
| 2.2.3.1 | Activities | 64 |
| 2.2.3.2 | Activity Diagram..... | 66 |

| | | |
|------------|--|------------|
| 2.2.4 | Class Modeling..... | 67 |
| 2.2.4.1 | Classes..... | 68 |
| 2.2.4.2 | Attributes..... | 70 |
| 2.2.4.3 | Associations..... | 71 |
| 2.2.4.4 | Aggregations..... | 72 |
| 2.2.4.5 | Generalizations..... | 73 |
| 2.2.4.6 | Class Diagram..... | 74 |
| 2.2.5 | Interaction Modeling..... | 75 |
| 2.2.5.1 | Interactions..... | 76 |
| 2.2.5.2 | Operations..... | 78 |
| 2.2.5.3 | Sequence Diagram..... | 79 |
| 2.2.6 | Statechart Modeling..... | 81 |
| 2.2.6.1 | States and Transitions..... | 82 |
| 2.2.6.2 | Statechart Diagram..... | 83 |
| 2.3 | Problem Statements for Case Studies..... | 85 |
| 2.3.1 | University Enrolment..... | 86 |
| 2.3.2 | Video Store..... | 87 |
| 2.3.3 | Contact Management..... | 88 |
| 2.3.4 | Telemarketing..... | 89 |
| | Summary..... | 90 |
| | Review Questions..... | 91 |
| | Exercise Questions..... | 92 |
| 3 | Requirements Determination..... | 94 |
| 3.1 | Principles of Requirements Determination..... | 94 |
| 3.2 | Requirements Elicitation..... | 95 |
| 3.2.1 | Traditional Methods of Requirements Elicitation..... | 97 |
| 3.2.1.1 | Interviewing Customers and Domain Experts..... | 97 |
| 3.2.1.2 | Questionnaires..... | 98 |
| 3.2.1.3 | Observation..... | 99 |
| 3.2.1.4 | Study of Documents and Software Systems..... | 99 |
| 3.2.2 | Modern Methods of Requirements Elicitation..... | 100 |
| 3.2.2.1 | Prototyping..... | 100 |
| 3.2.2.2 | Joint Application Development (JAD)..... | 101 |
| 3.2.2.3 | Rapid Application Development (RAD)..... | 102 |
| 3.3 | Requirements Negotiation and Validation..... | 103 |
| 3.3.1 | Out of Scope Requirements..... | 103 |
| 3.3.2 | Requirements Dependency Matrix..... | 104 |
| 3.3.3 | Requirements Risks and Priorities..... | 105 |
| 3.4 | Requirements Management..... | 106 |
| 3.4.1 | Requirements Identification and Classification..... | 106 |
| 3.4.2 | Requirements Hierarchies..... | 107 |
| 3.4.3 | Change Management..... | 108 |
| 3.4.4 | Requirements Traceability..... | 108 |
| 3.5 | Requirements Business Model..... | 109 |
| 3.5.1 | System Scope Model..... | 110 |
| 3.5.1.1 | Example for System Scope Modeling..... | 110 |
| 3.5.2 | Business Use Case Model..... | 112 |
| 3.5.2.1 | Example for Business Use Case Modeling..... | 113 |
| 3.5.3 | Business Class Model..... | 114 |
| 3.5.3.1 | Example for Business Class Modeling..... | 114 |

| | | |
|------------|--|------------|
| 3.6 | Requirements Document | 115 |
| 3.6.1 | Document Templates | 116 |
| 3.6.2 | Project Preliminaries | 117 |
| 3.6.3 | System Services..... | 118 |
| 3.6.4 | System Constraints | 119 |
| 3.6.5 | Project Matters | 120 |
| 3.6.6 | Appendices | 120 |
| | Summary | 120 |
| | Review Questions..... | 121 |
| | Exercise Questions..... | 122 |
| 4 | Requirements Specification | 124 |
| 4.1 | Principles of Requirements Specification | 124 |
| 4.2 | State Specifications..... | 126 |
| 4.2.1 | Modeling Classes | 126 |
| 4.2.1.1 | Discovering Classes | 127 |
| 4.2.1.1.1 | Noun Phrase Approach..... | 127 |
| 4.2.1.1.2 | Common Class Patterns Approach..... | 128 |
| 4.2.1.1.3 | Use Case Driven Approach | 129 |
| 4.2.1.1.4 | CRC Approach | 130 |
| 4.2.1.1.5 | Mixed Approach..... | 130 |
| 4.2.1.1.6 | Guidelines for Discovering Classes..... | 131 |
| 4.2.1.1.7 | Examples for Class Discovery..... | 131 |
| 4.2.1.2 | Specifying Classes..... | 135 |
| 4.2.1.2.1 | Naming Classes | 136 |
| 4.2.1.2.2 | Discovering and Specifying Class Attributes | 136 |
| 4.2.1.2.3 | Examples for Class Specifications | 137 |
| 4.2.2 | Modeling Associations | 144 |
| 4.2.2.1 | Discovering Associations | 144 |
| 4.2.2.2 | Specifying Associations | 145 |
| 4.2.2.3 | Example for Association Specifications..... | 145 |
| 4.2.3 | Modeling Aggregation and Composition Relationships..... | 147 |
| 4.2.3.1 | Discovering Aggregations and Compositions | 148 |
| 4.2.3.2 | Specifying Aggregations and Compositions | 149 |
| 4.2.3.3 | Example for Aggregation and Composition Specifications | 149 |
| 4.2.4 | Modeling Generalization Relationships | 151 |
| 4.2.4.1 | Discovering Generalizations | 151 |
| 4.2.4.2 | Specifying Generalizations..... | 152 |
| 4.2.4.3 | Example for Generalization Specifications | 152 |
| 4.2.5 | Modeling Objects | 153 |
| 4.2.5.1 | Specifying Objects | 154 |
| 4.2.5.2 | Example for Object Specifications | 154 |
| 4.3 | Behavior Specifications..... | 155 |
| 4.3.1 | Modeling Use Cases | 155 |
| 4.3.1.1 | Discovering Use Cases | 156 |
| 4.3.1.2 | Specifying Use Cases | 157 |
| 4.3.1.3 | Example for Use Case Specifications..... | 157 |
| 4.3.2 | Modeling Activities | 163 |
| 4.3.2.1 | Discovering Activities..... | 164 |
| 4.3.2.2 | Specifying Activities | 164 |
| 4.3.2.3 | Example for Activity Specifications | 164 |
| 4.3.3 | Modeling Interactions..... | 166 |
| 4.3.3.1 | Discovering Message Sequences..... | 166 |
| 4.3.3.2 | Specifying Message Sequences..... | 166 |

| | | |
|------------|--|------------|
| 4.3.3.3 | Example for Sequence Specifications | 167 |
| 4.3.4 | Modeling Public Interfaces..... | 168 |
| 4.3.4.1 | Discovering Class Operations | 169 |
| 4.3.4.2 | Specifying Class Operations | 169 |
| 4.3.4.3 | Example for Operation Specifications..... | 170 |
| 4.4 | State Change Specifications | 171 |
| 4.4.1 | Modeling Object States | 171 |
| 4.4.1.1 | Discovering Object States | 171 |
| 4.4.1.2 | Specifying Object States | 172 |
| 4.4.1.3 | Example for Statechart Specifications..... | 172 |
| | Summary | 173 |
| | Review Questions..... | 174 |
| | Exercise Questions..... | 175 |
| 5 | Advanced Analysis..... | 179 |
| 5.1 | Advanced Class Modeling | 179 |
| 5.1.1 | Stereotypes | 180 |
| 5.1.2 | Constraints..... | 181 |
| 5.1.3 | Notes and Tags | 183 |
| 5.1.4 | Visibility and Encapsulation..... | 184 |
| 5.1.4.1 | Protected Visibility..... | 185 |
| 5.1.4.2 | Visibility of Inherited Class Properties | 187 |
| 5.1.4.3 | Friend | 190 |
| 5.1.5 | Derived Information | 192 |
| 5.1.5.1 | Derived Attribute..... | 192 |
| 5.1.5.2 | Derived Association | 193 |
| 5.1.6 | Qualified Association | 194 |
| 5.1.7 | Association Class versus Reified Class | 196 |
| 5.1.7.1 | Example Statement for Employee Database | 196 |
| 5.1.7.2 | Model with Association Class | 197 |
| 5.1.7.3 | Model with Reified Class | 198 |
| 5.2 | Class Layers..... | 199 |
| 5.2.1 | Complexity of Networks | 200 |
| 5.2.2 | Complexity of Hierarchies | 201 |
| 5.2.3 | Package..... | 202 |
| 5.2.3.1 | Package Notation..... | 202 |
| 5.2.3.2 | Package Diagram..... | 203 |
| 5.2.4 | BCE Approach | 204 |
| 5.3 | Advanced Generalization and Inheritance Modeling..... | 206 |
| 5.3.1 | Generalization and Substitutability | 206 |
| 5.3.2 | Inheritance versus Encapsulation | 207 |
| 5.3.3 | Interface Inheritance..... | 207 |
| 5.3.4 | Implementation Inheritance | 208 |
| 5.3.4.1 | Proper Use of Implementation Inheritance – Extension Inheritance | 209 |
| 5.3.4.2 | Problematic Use of Implementation Inheritance – Restriction Inheritance..... | 210 |
| 5.3.4.3 | Improper Use of Implementation Inheritance – Convenience Inheritance..... | 210 |
| 5.3.4.4 | The Evils of Implementation Inheritance | 211 |
| 5.3.4.4.1 | Fragile Base Class | 212 |
| 5.3.4.4.2 | Overriding and Callbacks | 213 |
| 5.3.4.4.3 | Multiple Implementation Inheritance | 215 |
| 5.4 | Advanced Aggregation and Delegation Modeling..... | 215 |
| 5.4.1 | Putting More Semantics Into Aggregation | 216 |

| | | |
|------------|---|------------|
| 5.4.1.1 | The “ExclusiveOwns” Aggregation | 216 |
| 5.4.1.2 | The “Owns” Aggregation | 217 |
| 5.4.1.3 | The “Has” Aggregation | 218 |
| 5.4.1.4 | The “Member” Aggregation | 218 |
| 5.4.2 | Aggregation as Alternative to Generalization | 219 |
| 5.4.2.1 | Delegation and Prototypical Systems | 220 |
| 5.4.2.2 | Delegation versus Inheritance | 221 |
| 5.4.3 | Aggregation and Holons – Some Cerebral Ammunition | 221 |
| | Summary | 223 |
| | Review Questions | 224 |
| | Exercise Questions | 225 |
| 6 | <i>Underpinnings of System Design</i> | 227 |
| 6.1 | Software Architecture..... | 227 |
| 6.1.1 | Distributed Architecture | 228 |
| 6.1.2 | Three-Tier Architecture | 229 |
| 6.1.3 | Programming Databases | 230 |
| 6.1.3.1 | Application-Database Interaction | 230 |
| 6.1.3.2 | BCED Approach | 231 |
| 6.1.3.3 | System Software | 232 |
| 6.1.4 | Reuse Strategy | 233 |
| 6.1.4.1 | Toolkit Reuse | 234 |
| 6.1.4.2 | Framework Reuse | 234 |
| 6.1.4.3 | Pattern Reuse | 235 |
| 6.1.5 | Component | 235 |
| 6.1.5.1 | Component Notation | 236 |
| 6.1.5.2 | Component Diagram | 236 |
| 6.1.5.3 | Component versus Package | 237 |
| 6.1.5.4 | Component versus Class and Interface | 238 |
| 6.1.6 | Deployment | 239 |
| 6.1.6.1 | Node Notation | 239 |
| 6.1.6.2 | Deployment Diagram | 240 |
| 6.1.6.3 | Node versus Component | 240 |
| 6.2 | Collaboration..... | 241 |
| 6.2.1 | Collaboration Notation | 242 |
| 6.2.2 | Collaboration Diagram | 242 |
| 6.2.2.1 | Message Notation | 243 |
| 6.2.2.2 | Message Structure | 244 |
| 6.2.2.3 | Types of Messages | 245 |
| 6.2.2.4 | Overriding versus Overloading | 245 |
| 6.2.2.5 | Iteration Messages and Templates | 246 |
| 6.2.2.6 | Self Messages | 247 |
| 6.2.2.7 | Asynchronous Messages | 248 |
| 6.2.2.8 | Callbacks | 248 |
| 6.2.3 | Sequence Diagram versus Collaboration Diagram | 249 |
| 6.2.4 | Realization of Use Case | 250 |
| 6.2.4.1 | Structural Aspect of Collaboration | 250 |
| 6.2.4.2 | Behavioral Aspect of Collaboration | 251 |
| 6.2.5 | Realization of Operation | 252 |
| 6.3 | Guided Tutorial in Design Modeling..... | 255 |
| 6.3.1 | Package Design | 255 |
| 6.3.1.1 | Use Case Packages | 256 |
| 6.3.1.2 | Class Packages | 257 |
| 6.3.2 | Component Design | 260 |

| | | |
|------------|---|------------|
| 6.3.2.1 | Implementing Web Applications | 260 |
| 6.3.2.2 | Component Diagram | 261 |
| 6.3.3 | Deployment Design | 263 |
| 6.3.3.1 | Deploying Web Applications | 263 |
| 6.3.3.2 | Deployment Diagram | 264 |
| 6.3.4 | Collaboration Design | 265 |
| 6.3.4.1 | Elaborating Use Cases | 265 |
| 6.3.4.1.1 | Numbering and Structuring Requirements | 266 |
| 6.3.4.1.2 | Use Case Design Document | 267 |
| 6.3.4.2 | Structure of Collaboration | 270 |
| 6.3.4.3 | Behavior of Collaboration | 273 |
| | Summary | 275 |
| | Review Questions | 276 |
| | Exercise Questions | 277 |
| 7 | <i>User Interface Design</i> | 280 |
| 7.1 | Interface Design as Multidisciplinary Activity | 280 |
| 7.2 | From Interface Prototype to Implementation | 281 |
| 7.3 | Guidelines for User-Centered Interface Design | 283 |
| 7.3.1 | User in Control | 283 |
| 7.3.2 | Consistency | 284 |
| 7.3.3 | Personalization and Customization | 285 |
| 7.3.4 | Forgiveness | 285 |
| 7.3.5 | Feedback | 286 |
| 7.3.6 | Aesthetics and Usability | 286 |
| 7.4 | Interface Windows | 286 |
| 7.4.1 | Primary Window | 287 |
| 7.4.1.1 | Row Browser | 289 |
| 7.4.1.2 | Tree Browser | 291 |
| 7.4.1.3 | Web Page | 292 |
| 7.4.2 | Secondary Window | 293 |
| 7.4.2.1 | Dialog Box | 294 |
| 7.4.2.2 | Tab Folder | 296 |
| 7.4.2.3 | Drop-Down List | 298 |
| 7.4.2.4 | Message Box | 299 |
| 7.5 | Dependencies between Windows | 300 |
| 7.5.1 | Document versus View | 300 |
| 7.5.2 | Single Document Interface | 301 |
| 7.5.3 | Multiple Document Interface | 302 |
| 7.6 | Window Navigation | 303 |
| 7.6.1 | Stereotyping Activity Diagram for Window Navigation | 303 |
| 7.6.2 | Window Navigation Diagram | 305 |
| | Summary | 310 |
| | Review Questions | 311 |
| | Exercise Questions | 311 |
| 8 | <i>Database Design</i> | 315 |
| 8.1 | Persistent Database Layer | 315 |
| 8.1.1 | Data Models | 316 |
| 8.1.2 | Mapping Objects to Database | 317 |

| | | |
|------------|---|------------|
| 8.2 | Object Database Model..... | 318 |
| 8.2.1 | ODB Modeling Primitives..... | 318 |
| 8.2.1.1 | Literal and Object Types..... | 319 |
| 8.2.1.2 | Relationships and Inverses..... | 321 |
| 8.2.1.3 | ISA and EXTENDS Inheritance..... | 322 |
| 8.2.1.4 | Built-in Operations..... | 323 |
| 8.2.2 | Mapping to ODB..... | 326 |
| 8.2.2.1 | Mapping Entity Classes..... | 326 |
| 8.2.2.2 | Mapping Associations..... | 328 |
| 8.2.2.3 | Mapping Aggregations..... | 330 |
| 8.2.2.4 | Mapping Generalizations..... | 332 |
| 8.3 | Object-Relational Database Model..... | 333 |
| 8.3.1 | ORDB Modeling Primitives..... | 334 |
| 8.3.1.1 | Distinct and Structured Types..... | 335 |
| 8.3.1.2 | Object Tables..... | 336 |
| 8.3.1.3 | Row Types..... | 336 |
| 8.3.1.4 | Reference Types..... | 337 |
| 8.3.1.5 | Columns, Fields and Attributes..... | 337 |
| 8.3.1.6 | OF and UNDER Inheritance..... | 338 |
| 8.3.2 | Mapping to ORDB..... | 339 |
| 8.3.2.1 | Mapping Entity Classes..... | 339 |
| 8.3.2.2 | Mapping Associations..... | 340 |
| 8.3.2.3 | Mapping Aggregations..... | 342 |
| 8.3.2.4 | Mapping Generalizations..... | 343 |
| 8.4 | Relational Database Model..... | 345 |
| 8.4.1 | RDB Modeling Primitives..... | 345 |
| 8.4.1.1 | Columns, Domains and Rules..... | 347 |
| 8.4.1.2 | Relational Tables..... | 347 |
| 8.4.1.3 | Referential Integrity..... | 349 |
| 8.4.1.4 | Triggers..... | 350 |
| 8.4.1.5 | Relational Views..... | 352 |
| 8.4.1.6 | Normal Forms..... | 353 |
| 8.4.2 | Mapping to RDB..... | 354 |
| 8.4.2.1 | Mapping Entity Classes..... | 354 |
| 8.4.2.2 | Mapping Associations..... | 355 |
| 8.4.2.3 | Mapping Aggregations..... | 357 |
| 8.4.2.4 | Mapping Generalizations..... | 358 |
| | Summary..... | 362 |
| | Review Questions..... | 362 |
| | Exercise Questions..... | 363 |
| 9 | <i>Program and Transaction Design</i>..... | 365 |
| 9.1 | Designing the Program..... | 365 |
| 9.1.1 | Class Cohesion and Coupling..... | 366 |
| 9.1.1.1 | Kinds of Class Coupling..... | 367 |
| 9.1.1.2 | The Law of Demeter..... | 367 |
| 9.1.1.3 | Accessor Methods and Mindless Classes..... | 368 |
| 9.1.1.4 | Dynamic Classification and Mixed-Instance Cohesion..... | 371 |
| 9.1.2 | Designing Client/Server Collaboration..... | 374 |
| 9.1.2.1 | Stored Procedures..... | 376 |
| 9.1.2.2 | Triggers..... | 377 |
| 9.2 | Program Navigation..... | 378 |
| 9.2.1 | Stereotyping Activity Diagram for Program Navigation..... | 378 |

| | | |
|-------------|--|------------|
| 9.2.2 | Program Navigation Diagram..... | 379 |
| 9.3 | Designing the Transaction..... | 382 |
| 9.3.1 | Short Transaction | 382 |
| 9.3.1.1 | Pessimistic Concurrency Control | 382 |
| 9.3.1.2 | Levels of Isolation..... | 383 |
| 9.3.1.3 | Automatic Recovery..... | 384 |
| 9.3.1.4 | Programmable Recovery | 385 |
| 9.3.1.4.1 | Savepoint..... | 385 |
| 9.3.1.4.2 | Trigger Rollback | 386 |
| 9.3.1.5 | Designing Stored Procedures and Triggers | 386 |
| 9.3.2 | Long Transaction..... | 387 |
| 9.4 | Round-Trip Engineering | 388 |
| 9.4.1 | Round-Trip Engineering with Client Program | 388 |
| 9.4.2 | Round-Trip Engineering with Database | 390 |
| 9.4.3 | Reengineering from Relational to Object-Relational Database..... | 391 |
| | Summary | 393 |
| | Review Questions..... | 394 |
| | Exercise Questions..... | 395 |
| 10 | Testing and Change Management..... | 396 |
| 10.1 | Testing System Services..... | 396 |
| 10.1.1 | Walkthrough..... | 397 |
| 10.1.2 | Inspection | 397 |
| 10.1.3 | Testing to Specs..... | 398 |
| 10.1.4 | Testing to Code | 399 |
| 10.2 | Testing System Constraints..... | 399 |
| 10.2.1 | User Interface Testing | 400 |
| 10.2.2 | Database Testing | 401 |
| 10.2.3 | Authorization Testing..... | 401 |
| 10.2.4 | Testing of Other Constraints..... | 403 |
| 10.3 | Test and Change Management Documents | 404 |
| 10.4 | Managing Change | 406 |
| 10.4.1 | Submitting Change Request | 407 |
| 10.4.2 | Keeping Track of Change Requests | 408 |
| 10.5 | Traceability..... | 409 |
| 10.5.1 | System Features to Use Cases and Use Case Requirements..... | 410 |
| 10.5.2 | Test Plans to Test Cases and Test Requirements..... | 411 |
| 10.5.3 | UML Diagrams to Documents and Requirements..... | 412 |
| 10.5.4 | Use Case Requirements to Test Requirements..... | 414 |
| 10.5.5 | Test Requirements to Defects..... | 414 |
| 10.5.6 | Use Case Requirements to Enhancements..... | 415 |
| | Summary | 416 |
| | Review Questions..... | 417 |
| | Bibliography | 418 |
| | Index | 424 |