The Design of Well-Structured and Correct Programs

Suad Alagić
Michael A. Arbib
## Contents

1 Introducing Top-down Design
   1.1 The Idea of Top-down Design  1
   1.2 An Example: The Greatest Common divisor  2
   1.3 Programming Language and Machine Language  10

2 Basic Compositions of Actions and Their Proof Rules  15
   2.1 Relations for Program Correctness  15
   2.2 Logical Formulas and Pascal Expressions  20
   2.3 Proof Rules for Simple Statements  27
   2.4 Compound and Conditional Statements  29
   2.5 Repetitive Statements  33
   2.6 Summary of Basic Proof Rules  38
   2.7 Using the Basic Proof Rules  39
   2.8 Correct Termination of Algorithms  47
Exercises  52

3 Data Types  57
   3.1 Introduction  57
   3.2 A Primer on Set Theory  58
   3.3 Scalar Types and Simple Types  65
   3.4 Arrays, Records, and Files  75
   3.5 Processing Arrays  90
   3.6 Processing Files and Records  96
   3.7 Set Manipulation in Pascal  105
Exercises  111