

# Contents

<b>1</b>	<b>Introduction</b>	<b>3</b>
1.1	DNA, enzymes and membranes . . . . .	4
1.1.1	DNA structure . . . . .	4
1.1.2	Enzymes . . . . .	6
1.1.3	Membranes . . . . .	9
1.2	Molecular Computing . . . . .	11
1.3	Splicing Systems . . . . .	13
1.4	Membrane Systems . . . . .	15
1.5	From H to P . . . . .	16
<b>2</b>	<b>Parallel Arithmetic</b>	<b>21</b>
2.1	Introduction . . . . .	21
2.2	An Overview of Splicing . . . . .	22
2.3	Addition and Subtraction . . . . .	23
2.4	Multiplication . . . . .	25
2.5	Integer Division . . . . .	28
2.6	The Filter . . . . .	31
2.7	Final Remarks . . . . .	33
<b>3</b>	<b>Diophantine Equation</b>	<b>35</b>
3.1	Introduction . . . . .	35
3.2	An Overview on Diophantine Equations . . . . .	36
3.3	An Overview on Splicing . . . . .	37
3.4	Solver . . . . .	38
3.5	Final Remarks . . . . .	42
<b>4</b>	<b>Communicating H Systems</b>	<b>45</b>
4.1	Introduction . . . . .	45
4.2	An Overview on Splicing . . . . .	46
4.3	Two Symbols Filter . . . . .	49
4.4	One-way Communication . . . . .	53
4.5	Final Remarks . . . . .	55
<b>5</b>	<b>Splicing P Systems</b>	<b>57</b>
5.1	Introduction . . . . .	57
5.2	Splicing and P Systems . . . . .	58
5.3	Splicing P Systems . . . . .	61
5.4	P Systems on Asymmetric Graphs . . . . .	64

5.5	Final Remarks . . . . .	67
<b>6</b>	<b>Universal H System</b>	<b>69</b>
6.1	Introduction . . . . .	69
6.2	An Overview of Splicing . . . . .	70
6.3	Inside the Algorithm . . . . .	73
6.4	Basic Operations . . . . .	74
6.5	Overview of the Construction . . . . .	82
6.6	The Complexity of the System . . . . .	90
6.7	Final Remarks . . . . .	91
<b>7</b>	<b>Universal P System</b>	<b>93</b>
7.1	Introduction . . . . .	93
7.2	An Overview of Splicing and P Systems . . . . .	95
7.3	Coding the Simulated System . . . . .	96
7.4	Basic Operations . . . . .	98
7.5	The Construction of the Universal P System . . . . .	104
7.6	The Complexity of the System . . . . .	111
7.7	Final Remarks . . . . .	112
<b>8</b>	<b>P Systems with Symport/Antiport</b>	<b>113</b>
8.1	Introduction . . . . .	113
8.2	Basic definitions . . . . .	114
8.3	Preliminaries . . . . .	118
8.4	Single Membrane . . . . .	120
8.5	Symport Only . . . . .	122
8.6	Minimal Symports . . . . .	124
8.7	Following the traces . . . . .	128
8.8	Résumé and Outlook . . . . .	131
<b>9</b>	<b>Conformon-P Systems</b>	<b>135</b>
9.1	Introduction . . . . .	135
9.2	The conformon in molecular biology . . . . .	136
9.3	Basic definitions . . . . .	137
9.4	Basic conformon-P systems . . . . .	139
9.5	Finite total value . . . . .	144
9.6	Unbounded total value . . . . .	152
9.7	Final remarks . . . . .	156