

Contents

1	Introduction	5
2	Preliminaries	11
2.1	Relations and ordered sets	11
2.2	Algebras	16
2.3	Semilattices and lattices	19
2.4	Ideals and filters in lattices and their applications	21
2.5	Galois connections	23
2.6	Residuated structures	25
2.7	Modules over ordered structures	26
2.8	MacNeille completion	29
2.9	Heyting algebras	31
2.10	Effect algebras	33
3	Tense logics	41
4	Quantifiers	47
5	Tense Boolean algebras	53
5.1	The tense algebra	53
5.2	The construction of tense operators	55
5.3	Modal and necessity Boolean algebras	58
6	Dynamic algebras	63
6.1	Dynamic pairs	63
6.2	The construction	65
6.3	Relations between bounded poset morphisms	72
6.4	Representation of Galois connections	74
6.5	Set representation of dynamic order algebras	78
6.6	Representation of tense algebras	80
6.7	Dynamic order algebras and their MacNeille completion	84
6.8	Parallel worlds and representations of tense order algebras	85

CONTENTS

7	Tense De Morgan posets	90
7.1	Tense De Morgan posets and their construction	90
7.2	Representation and approximation	93
7.3	Set representation of tense De Morgan posets	98
7.4	Set representation of tense orthocomplemented posets	101
8	Tense distributive algebras	109
8.1	Tense, modal and necessity distributive algebras	109
8.2	Tense distributive De Morgan algebras	116
8.3	Tense operators in intuitionistic logic	120
8.4	Finitely approximable Heyting algebras	129
9	Tense operators in quantum logic	132
9.1	Tense operators in effect algebras and their construction	133
9.2	Representation and approximation	139
9.3	Tense operators on q-effect algebras	144
9.4	Tense operators on spaces of numerical events	155
10	Tense operators in fuzzy logic	168
10.1	Fuzzy dynamic pairs and fuzzy tense algebras	169
10.2	Fuzzy binary relations and general fuzzy Galois connections	178
	Index	188
	Bibliography	195