

Contents

<i>Preface</i>	<i>page</i> ix
<i>Acknowledgments</i>	xi
1 The Fourier and Laplace Transforms	1
1.1 Definition of the Laplace Transform	1
1.2 Phasors and Frequency Spectra	5
1.3 How These Transforms Work	10
1.4 Transforms as Inner Products	17
1.5 Relating Laplace $F(s)$ to Fourier $F(\omega)$	21
1.6 Inverse Transforms	33
1.7 Problems	38
2 Laplace-Transform Examples	40
2.1 Constant Functions	41
2.2 Exponential Functions	52
2.3 Sinusoidal Functions	56
2.4 t^n Functions	71
2.5 Hyperbolic Functions	78
2.6 Problems	91
3 Properties of the Laplace Transform	92
3.1 Linearity	92
3.2 Time and Frequency Shifting	94
3.3 Scaling	97
3.4 Time-Domain Differentiation	99
3.5 Time-Domain Integration	102
3.6 Multiplication and Division of $f(t)$ by t	104
3.7 Transform of Periodic Functions	107
3.8 Convolution	111

3.9	Initial- and Final-Value Theorems	115
3.10	Problems	119
4	Applications of the Laplace Transform	121
4.1	Differential Equations	121
4.2	Mechanical Oscillations	127
4.3	Electric-Circuit Oscillations	139
4.4	Heat Flow	151
4.5	Waves	160
4.6	Transmission Lines	166
4.7	Problems	172
5	The Z-Transform	174
5.1	Introduction to the Z-Transform	175
5.2	Examples of the Z-transform	184
5.3	Characteristics of the Z-transform	194
5.4	Problems	203
	<i>Further Reading</i>	205
	<i>Index</i>	206