

Contents

CHAPTER 1	Probability	1
1.1	Introduction	1
1.2	Sample Space and Events	1
1.3	Algebra of Sets	2
1.4	Probability Space	6
1.5	Equally Likely Events	9
1.6	Conditional Probability	10
1.7	Total Probability	10
1.8	Independent Events	11
	Solved Problems	12
CHAPTER 2	Random Variables	50
2.1	Introduction	50
2.2	Random Variables	50
2.3	Distribution Functions	52
2.4	Discrete Random Variables and Probability Mass Functions	53
2.5	Continuous Random Variables and Probability Density Functions	54
2.6	Mean and Variance	54
2.7	Some Special Distributions	55
2.8	Conditional Distributions	64
	Solved Problems	65
CHAPTER 3	Multiple Random Variables	101
3.1	Introduction	101
3.2	Bivariate Random Variables	101
3.3	Joint Distribution Functions	102
3.4	Discrete Random Variables—Joint Probability Mass Functions	103
3.5	Continuous Random Variables—Joint Probability Density Functions	104
3.6	Conditional Distributions	105
3.7	Covariance and Correlation Coefficient	106
3.8	Conditional Means and Conditional Variances	107
3.9	N -Variate Random Variables	108
3.10	Special Distributions	110
	Solved Problems	112

CHAPTER 4	Functions of Random Variables, Expectation, Limit Theorems	149
4.1	Introduction	149
4.2	Functions of One Random Variable	149
4.3	Functions of Two Random Variables	150
4.4	Functions of n Random Variables	151
4.5	Expectation	152
4.6	Probability-Generating Functions	154
4.7	Moment-Generating Functions	155
4.8	Characteristic Functions	156
4.9	The Laws of Large Numbers and the Central Limit Theorem	158
	Solved Problems	159
CHAPTER 5	Random Processes	207
5.1	Introduction	207
5.2	Random Processes	207
5.3	Characterization of Random Processes	208
5.4	Classification of Random Processes	209
5.5	Discrete-Parameter Markov Chains	211
5.6	Poisson Processes	216
5.7	Wiener Processes	218
5.8	Martingales	219
	Solved Problems	222
CHAPTER 6	Analysis and Processing of Random Processes	271
6.1	Introduction	271
6.2	Continuity, Differentiation, Integration	271
6.3	Power Spectral Densities	273
6.4	White Noise	275
6.5	Response of Linear Systems to Random Inputs	276
6.6	Fourier Series and Karhunen-Loéve Expansions	279
6.7	Fourier Transform of Random Processes	280
	Solved Problems	282
CHAPTER 7	Estimation Theory	312
7.1	Introduction	312
7.2	Parameter Estimation	312
7.3	Properties of Point Estimators	312
7.4	Maximum-Likelihood Estimation	313
7.5	Bayes' Estimation	314
7.6	Mean Square Estimation	314
7.7	Linear Mean Square Estimation	315
	Solved Problems	316
CHAPTER 8	Decision Theory	331
8.1	Introduction	331
8.2	Hypothesis Testing	331
8.3	Decision Tests	332
	Solved Problems	335

CHAPTER 9	Queueing Theory	349
9.1	Introduction	349
9.2	Queueing Systems	349
9.3	Birth-Death Process	350
9.4	The M/M/1 Queueing System	352
9.5	The M/M/ s Queueing System	352
9.6	The M/M/1/ K Queueing System	353
9.7	The M/M/ s / K Queueing System	354
	Solved Problems	355
CHAPTER 10	Information Theory	367
10.1	Introduction	367
10.2	Measure of Information	367
10.3	Discrete Memoryless Channels	369
10.4	Mutual Information	371
10.5	Channel Capacity	373
10.6	Continuous Channel	374
10.7	Additive White Gaussian Noise Channel	375
10.8	Source Coding	376
10.9	Entropy Coding	378
	Solved Problems	380
APPENDIX A	Normal Distribution	411
APPENDIX B	Fourier Transform	413
B.1	Continuous-Time Fourier Transform	413
B.2	Discrete-Time Fourier Transform	414
INDEX		417