APPENDIX B PROBABILITY AND RANDOM VARIABLES

Digital and Analog
COMMUNICATION SYSTEMS

Eighth Edition

LEON W. COUCH, II

Professor Emeritus Electrical and Computer Engineering University of Florida, Gainesville

Copyright © 2013, 2007, 2002 Pearson Education, Inc., publishing as Prentice Hall

•						600
н]	 m	TOC	111C1	tion	680

- B-2 Sets 681
- B-3 Probability and Relative Frequency 682 Simple Probability, 682 Joint Probability, 683 Conditional Probabilities, 684
- B-4 Random Variables 685
- B-5 Cumulative Distribution Functions and Probability Density I Properties of CDFs and PDFs, 688 Discrete and Continuous Distributions, 688
- B-6 Ensemble Average and Moments
 Ensemble Average, 692
 Moments, 693
- B-7 Examples of Important Distributions 695
 Binomial Distribution, 695
 Poisson Distribution, 698
 Uniform Distribution, 698
 Gaussian Distribution, 698
 Sinusoidal Distribution, 703
- B-8 Functional Transformations of Random Variables 704
- B-9 Multivariate Statistics 709
 Multivariate CDFs and PDFs, 709
 Bivariate Statistics, 711
 Gaussian Bivariate Distribution, 712
 Multivariate Functional Transformation, 712
 Central Limit Theorem, 715

Problems 716

6 RANDOM PROCESSES AND SPECTRAL ANALYSIS

- 6–1 Some Basic Definitions 415
 Random Processes, 415
 Stationarity and Ergodicity, 416
 Correlation Functions and Wide-Sense Stationarity, 420
 Complex Random Processes, 423
- 6–2 Power Spectral Density 424
 Definition, 424
 Wiener-Khintchine Theorem, 426
 Properties of the PSD, 428
 General Formula for the PSD of Digital Signals, 433
 White-Noise Processes, 435
 Measurement of PSD, 436
- 6-4 Linear Systems 439 Input-Output Relationships, 439
- 6-5 Bandwidth Measures 444

 Equivalent Bandwidth, 444

 RMS Bandwidth, 444
- 6–6 The Gaussian Random Process 446 Properties of Gaussian Processes, 448
- 6–7 Bandpass Processes 450
 Bandpass Representations, 450
 Properties of WSS Bandpass Processes, 454
 Proofs of Some Properties, 459
- 6–8 Matched Filters 464
 General Results, 464
 Results for White Noise, 466
 Correlation Processing, 469
 Transversal Matched Filter, 471

7 PERFORMANCE OF COMMUNICATION SYSTEMS CORRUPTED BY NOISE

- 7–1 Error Probabilities for Binary Signaling 493
 General Results, 493
 Results for Gaussian Noise, 495
 Results for White Gaussian Noise and Matched-Filter Reception, 497
 Results for Colored Gaussian Noise and Matched-Filter Reception, 498
- 7–2 Performance of Baseband Binary Systems 499
 Unipolar Signaling, 499
 Polar Signaling, 502
 Bipolar Signaling, 502
- 7–3 Coherent Detection of Bandpass Binary Signals 504 On-Off Keying, 504 Binary-Phase-Shift Keying, 506 Frequency-Shift Keying, 507