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## Nota di contenuto

Statistical Methods in Radiation Physics; Contents; Preface; 1 The Statistical Nature of Radiation, Emission, and Interaction; 1.1 Introduction and Scope; 1.2 Classical and Modern Physics - Determinism and Probabilities; 1.3 Semiclassical Atomic Theory; 1.4 Quantum Mechanics and the Uncertainty Principle; 1.5 Quantum Mechanics and Radioactive Decay; Problems; 2 Radioactive Decay; 2.1 Scope of Chapter; 2.2 Radioactive Disintegration - Exponential Decay; 2.3 Activity and Number of Atoms; 2.4 Survival and Decay Probabilities of Atoms; 2.5 Number of Disintegrations - The Binomial Distribution; 2.6 CritiqueProblems; 3 Sample Space, Events, and Probability; 3.1 Sample Space; 3.2 Events; 3.3 Random Variables; 3.4 Probability of an Event; 3.5 Conditional and Independent Events; Problems; 4 Probability Distributions and Transformations; 4.1 Probability Distributions; 4.2 Expected Value; 4.3 Variance; 4.4 Joint Distributions; 4.5 Covariance; 4.6 Chebyshev's Inequality; 4.7 Transformations of Random Variables; 4.8 Bayes' Theorem; Problems; 5 Discrete Distributions; 5.1 Introduction; 5.2 Discrete Uniform Distribution; 5.3 Bernoulli Distribution; 5.4 Binomial Distribution; 5.5 Poisson Distribution; 5.6 Hypergeometric Distribution; 5.7 Geometric Distribution; 5.8 Negative Binomial Distribution; Problems; 6 Continuous Distributions; 6.1 Introduction; 6.2 Continuous Uniform Distribution; 6.3 Normal Distribution; 6.4 Central Limit Theorem; 6.5 Normal Approximation to the Binomial Distribution; 6.6 Gamma Distribution; 6.7 Exponential Distribution; 6.8 Chi-Square Distribution; 6.9 Student's t-Distribution; 6.10 F Distribution; 6.11 Lognormal Distribution; 6.12 Beta Distribution; Problems; 7 Parameter and Interval Estimation; 7.1 Introduction; 7.2 Random and Systematic Errors; 7.3 Terminology and Notation; 7.4 Estimator Properties; 7.5 Interval Estimation of Parameters; 7.5.1 Interval Estimation for Population Mean; 7.5.2 Interval Estimation for the Proportion of Population; 7.5.3 Estimated Error; 7.5.4 Interval Estimation for Poisson Rate Parameter; 7.6 Parameter Differences for Two Populations; 7.6.1 Difference in Means; 7.6.1.1 Case 1:  $\sigma_x$  and  $\sigma_y$  Known; 7.6.1.2 Case 2:  $\sigma_x$  and  $\sigma_y$  Unknown, but Equal ( $=\sigma$ ); 7.6.1.3 Case 3:  $\sigma_x$  and  $\sigma_y$  Unknown and Unequal; 7.6.2 Difference in Proportions; 7.7 Interval Estimation for a Variance; 7.8 Estimating the Ratio of Two Variances; 7.9 Maximum Likelihood Estimation; 7.10 Method of Moments; Problems; 8 Propagation of Error; 8.1 Introduction; 8.2 Error Propagation; 8.3 Error Propagation Formulas; 8.3.1 Sums and Differences; 8.3.2 Products and Powers; 8.3.3 Exponentials; 8.3.4 Variance of the Mean; 8.4 A Comparison of Linear and Exact Treatments; 8.5 Delta Theorem; Problems; 9 Measuring Radioactivity; 9.1 Introduction; 9.2 Normal Approximation to the Poisson Distribution; 9.3 Assessment of Sample Activity by Counting; 9.4 Assessment of Uncertainty in Activity; 9.5 Optimum Partitioning of Counting Times

## Sommario/riassunto

This statistics textbook, with particular emphasis on radiation protection and dosimetry, deals with statistical solutions to problems inherent in health physics measurements and decision making. The authors begin with a description of our current understanding of the statistical nature of physical processes at the atomic level, including radioactive decay and interactions of radiation with matter. Examples are taken from problems encountered in health physics, and the material is presented such that health physicists and most other nuclear professionals will more readily understand the app