Statistics for engineers

Second List of Problems
Introduction to Mathematical Statistics

1. Assume that for the *characteristic* X of some *general population* we have a *simple sample*

$$(x_1, x_2, \ldots, x_n) = (X_1, X_2, \ldots, X_n)(\omega_o),$$

where

$\omega_o \in \Omega,\ X_1, X_2, \ldots, X_n$ are identically distributed as X and independent.

Draw the *histogram* and *empirical cummulative distribution function*, if

$$(x_1, x_2, \ldots, x_n) = (1.07; 1.0; 0.98; 0.99; 1.1; 1.15; 0.99; 0.79; 0.82; 0.91).$$

2. For a simple sample given in the task 1, compute:

   (a) the *mean of simple sample*

$$\bar{x}_n = \bar{X}(\omega_o) = \frac{1}{n}(X_1(\omega_o) + X_2(\omega_o) + \ldots X_n(\omega_o));$$

   (b) the *variance of simple sample*

$$s_n^2 = S_n^2(\omega_o) = \frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x}_n)^2;$$

   (c) the *S–square pick value*

$$\widehat{s}_n^2 = \widehat{S}_n^2(\omega_o) = \frac{n}{n-1}S_n^2(\omega_o).$$

3. By using the table of probability distributions compute the *critical value*, if characteristic X of general population has:

   (a) *chi–square* distribution with 10 *degree of freedom* and $\alpha = 0.05$;

   (b) *t–Student* distribution with 15 *degree of freedom* and $\alpha = 0.1$.