

Problem 4.11 Estimate the failure probability for the performance function and random variables defined in Problem 4.2 using the following methods:

- a. DMCS
- b. CE by trying each variable in the problem as a control variable

Examine the trends using $N = 100, 1000, 2000$, and 5000 cycles.

- Problem 4.2** For the performance function of Problem 4.1, determine the safety index (β) and the failure probability (P_f) using
- First-order reliability method
 - Advanced second-moment method

The noncorrelated random variables are assumed to have the following probabilistic characteristics:

Random Variable	Mean Value	Coefficient of Variance (COV)	Distribution Type
X_1	10	0.25	Lognormal
X_2	4	0.20	Lognormal
X_3	3	0.40	Lognormal