

Problem 4.12 Estimate the failure probability for the performance function and random variables defined in Problem 4.3 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 4.3 For the following performance function, determine the safety index (β) and the failure probability (P_f) using

- a. First-order reliability method
- b. Advanced second-moment method

$$Z = X_1 - X_2/X_3$$

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

Random Variable	Mean Value	Coefficient of Variance (COV)	Distribution Type
X_1	5	0.25	Normal
X_2	8	0.40	Normal
X_3	2	0.80	Normal