Reliability Analysis with Explicit Limit-state Function

Consider the limit-state function

$$g(\mathbf{x}) = 1 - \frac{x_2}{1000 \cdot x_3} - \left(\frac{x_1}{200 \cdot x_3} \right)^2$$

where X_1 is a lognormal random variable with mean 500 and standard deviation 100; X_2 is a lognormal random variable with mean 2000 and standard deviation 400; and X_3 is a uniform random variable with mean 5 and standard deviation 0.5. The correlation matrix for these random variables is

$$R = \begin{bmatrix} 1 & 0.3 & 0.2 \\ 0.3 & 1 & 0.2 \\ 0.2 & 0.2 & 1 \end{bmatrix}$$

a) Estimate the failure probability by Monte Carlo sampling
b) Estimate the reliability index and failure probability by FORM
c) Estimate failure probability by importance sampling around the design point
d) Compare and discuss the results from the previous questions
e) Identify the most and least "important" random variable