

Homework 5 FOSM

1. The limit-state function of a shaft in a speed reducer is defined by the difference between the strength and the maximum equivalent stress. It is given by

$$g(\mathbf{X}) = S - \frac{16}{\pi d^3} \sqrt{4F^2 l^2 + 3T^2}$$

where

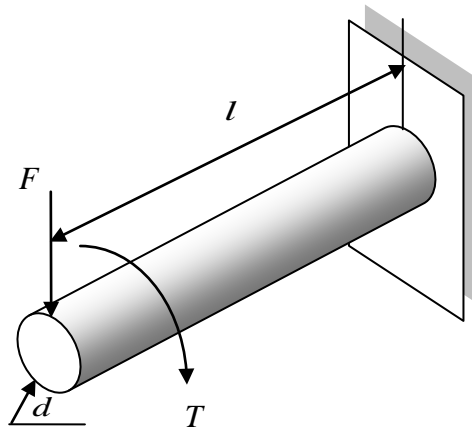
$d = 39$ mm, the diameter of the shaft

$l = 400$ mm, the length of the shaft

F = the external force

T = the external torque

S = the yield strength



The distributions of the independent random variables are given below.

Table 1 Distributions

Variables	Mean	Std	Distribution
External force F	2000 N	220 N	Normal
Torque T	450 N·m	50 N·m	Normal
Strength S	250 MPa	30 MPa	Normal

Use FOSM to calculate the probability of failure.