University of Maryland

Department of Civil and Environmental Engineering
College Park, Maryland

Simulation Project

ENCE 302 – Probability and Statistics for Civil Engineers – FALL 2001

Team 2

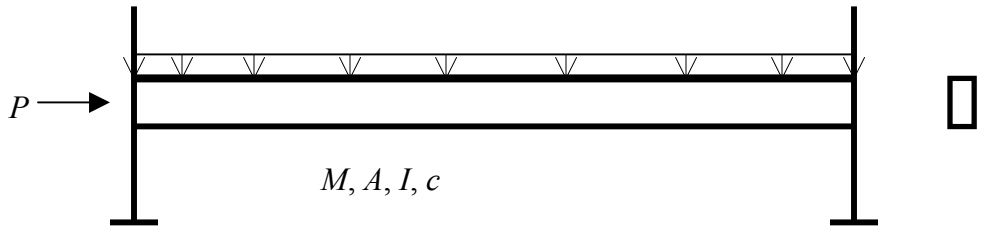
Members:

1) Fitzpatrick, Casey Brendon (leader)
2) Lawhorn, Angela Marie
3) Mattoon, Melanie Nichole
4) Osborne, Anthony Glen

Problem Statement:

Each team is required to investigate the compressive stress at the extreme fiber of a steel beam shown below. The compressive stress at the extreme fiber is given by

$$\sigma = \frac{P}{A} + \frac{Mc}{I} \leq F_y$$



where σ = computed compressive stress, c = distance from the neutral axis to the extreme fiber, P = applied axial load, M = applied moment due to external loads, A = cross sectional area of the beam, I = centriodal moment of inertia of the cross section, and F_y = yield strength of steel. The variables c, P, M, A, I, and F_y are called basic random variables. The probabilistic characteristics of these variables are provided in the table shown below (Table 1).

1. Determine the probabilistic characteristic of the compressive stress σ.
2. Compute the yield stress exceedence probability.
3. Perform parametric analysis.
4. Develop additional items of your own creation.
5. Prepare a report that also includes your findings and the results on the experimental simulation of two dice/coins.

Table 1. Probabilistic Characteristic of Basic Random Variables for the Stress σ

Random Variable	Mean	Coefficient of Variation (*COV*)	Distribution Type
c (in)	12	-	-
P (kip)	185	0.18	Lognormal
M (kip-in)	3,550	0.28	Lognormal
A (in^2)	185	0.10	Normal
I (in^4)	1,400	0.06	Normal
F_y (ksi)	40	0.15	Lognormal

Report:

Professional presentation of the project report is required. It should consist of neat and organized solutions on one side of 8.5"x11" papers. Computer and spreadsheet-generated plots and printouts are required for all samples and summary calculations. The report should include:

- Title Page, Abstract, and Table of Contents
- Problem Description
- Objectives
- Methodology
- Simulation Data
- Probabilistic Characteristics of σ
- Yield Strength Exceedence Probability
- Parametric Analysis
- Confidence Intervals
- Additional Items
- Conclusions
- References and Appendices (if applicable)

Due Date:

The project is due on the last day of classes.