# 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 4

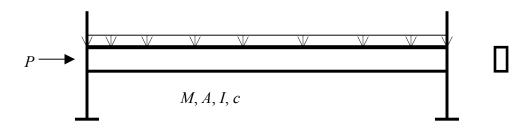
Members:

- 1) Bauer, Gregory P. (leader)
- 2) Crider, Joseph Scott
- 3) Siebs, Alexis Burpee
- 4) Tolman, Matthew James

#### **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

$$\sigma = \frac{P}{A} + \frac{Mc}{I} \le F_{y}$$



where  $\sigma$  = 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  $\sigma$ .
- 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.

Random Variable	Mean	Coefficient of Variation (COV)	Distribution Type
<i>c</i> (in)	10	0.05	Normal
P(kip)	350	0.20	Lognormal
M (kip-in)	3,000	0.30	Lognormal
$A(in^2)$	209	0.05	Normal
$I(in^4)$	1,500	0.08	Normal
$F_{y}$ (ksi)	36	0.15	Lognormal

Table 1. Probabilistic Characteristic of Basic Random Variables for the Stress  $\sigma$ 

## **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  $\sigma$
- 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.