The University of Melbourne
CVEN30008 Engineering Risk Analysis

Tutorial 10

(I) Power and Sample Size

1. **A new chemical process has been developed that may increase the yield over that of the current process. The current process is known to have a mean yield of 80 and a standard deviation of 5, where the units are the percentage of a theoretical maximum. If the mean yield of the new process is shown to be greater than 80, the new process will be put into production. It is proposed to run the new process 50 times and test the hypothesis that the mean yield of the new process is greater than 80 at a significance level of 5%. What is the power of this test? What is your suggestion based on the calculated power?**

   Assume that the mean yield of the new process is in fact 81 and its standard deviation is the same as that of the current process (σ=5).

(II) Simple Linear Regression

2. A structural engineer is investigating the dynamic response of a concrete slab subject to projectile impact. The measurements indicated in the following table were obtained from 5 tests.

Mass of Impactor (kg)	Maximum contact force (kN)	Maximum Displacement (mm)
1	6.7	0.5
5	20	0.8
10	50	4
20	120	8
50	250	12

a). Compute the correlation between mass of impactor and maximum contact force.

b). Compute the correlation between mass of impactor and maximum displacement.

c). Compute the least-squares line for predicting maximum contact force from mass of impactor

d). What is the maximum contact force if the impactor mass is 25 kg?

e). Compute the least-squares line for predicting maximum displacement from mass of impactor

f). In order to induce a maximum displacement value of 10 mm, what is the mass of impactor?

g). Verify your results by using MATLAB.

3. **The structural engineer later on study the effect of impacting velocity on the maximum contact force. The measurements indicated in the following table were obtained from 8 tests.**

Impactoring velocity (m/s)	Maximum contact force (kN)
2	20
4	33
6	65
8	69
10	90
12	110
14	130
16	158

Is there evidence of a linear relationship between impacting velocity and maximum contact force at the 0.05 level of significance? Verify your results by using MATLAB.