Engineering Mathematics II, Mid-term Exam #3
Probability and Statistics

Civil Engineering 06, June 6, 2008

*Use your own calculator!

Question 1:[20 marks] A and B are two students in the course *Fluid Mechanics* given by Dr. N. Gao in the spring of 2008. The possibility for student A to come to class on time is approximately 5%, while the possibility for B to come to class is about 10%. They have different interests and they do not live in the same room.
Find: (a) the possibility that B shows up in one lecture, and A is on time that day; (b) suppose that there are 40 lectures in total, what is the possibility that B shows up and A comes on time for at least twice?

Question 2:[20 marks] Marks of the course *Engineering Mathematics II* given by Dr. N. Gao in the fall of 2007 follow a normal distribution with a mean of 86 and a standard deviation of 5. Find the possibility that student A gets a mark less than 80, also find the possibility for student A to get a mark more than 95.

Question 3:[20 marks] In the hardness test of a concrete block(recall last summer in HKU), you need to measure the diameter of the indentation on the block for 36 independent tests. The samples have a mean of 4.5mm and a standard deviation of 0.6mm. (a) Construct an interval with 95% confidence level to estimate the true mean, μ. (b) How many tests you have to do if you want the error to be less than 0.1mm.

Question 4:[20 marks] A factory produces a certain type of beam. The maximum load that these beams withstand follows normal distribution $N(50, 1.5^2)$ tons. After a new technology was used in the production, 9 samples were tested and the sample mean is $\overline{x} = 51.1$ tons. Evaluate if this new technology effective for significance level of $\alpha = 0.05$.

Question 5:[20 marks] Prove the variance $V(X)$ of a random variable X and the expectation $E(X)$ has the following relationship

$$V(X) = E(X^2) - (E(X))^2$$