CIE 272

Civil Engineering Measurements

Exam #2

November 11, 2002

Directions:

1. Write your name on your exam book, NOW!
2. **Read the questions carefully**. Most errors on timed examinations are the result of not understanding what is being asked.
3. **DON'T PANIC!** Answer the easier questions first. Questions that I think are difficult have been marked with a *.

Good Luck!

1. **(50 Points)** The concentrations of chloride and total phosphate were measured on 30 consecutive days in the River Ouse in England. The data have been sorted according to the chloride concentration for your convenience. Use the data to answer the following questions.

	Chloride mg/L	Phosphate mg/L
	60.0	2.07
	61.0	1.72
	62.0	1.68
	62.0	1.73
	63.0	1.82
	63.0	1.81
	63.0	1.89
	64.0	1.31
	64.0	1.59
	64.0	1.98
	64.0	1.97
	64.0	1.74
	65.0	1.89
	65.0	1.99
	65.0	1.98
	65.0	1.58
	65.0	1.93
	66.0	1.39
	66.0	1.86
	66.0	1.65
	66.0	1.94
	67.0	2.15
	67.0	2.12
	68.0	2.01
	68.0	1.90
	68.0	1.86
	69.0	1.92
	69.0	1.74
	69.0	1.58
	70.0	1.90
Mean	**65.27**	**1.82**
Std. Dev.	**2.53**	**0.200**

a. (10) Draw a histogram for the chloride concentration. Use an interval width of 1.0 mg/L.

b. (5) Is it reasonable to assume that the chloride concentration is normally distributed? **Explain your answer.**

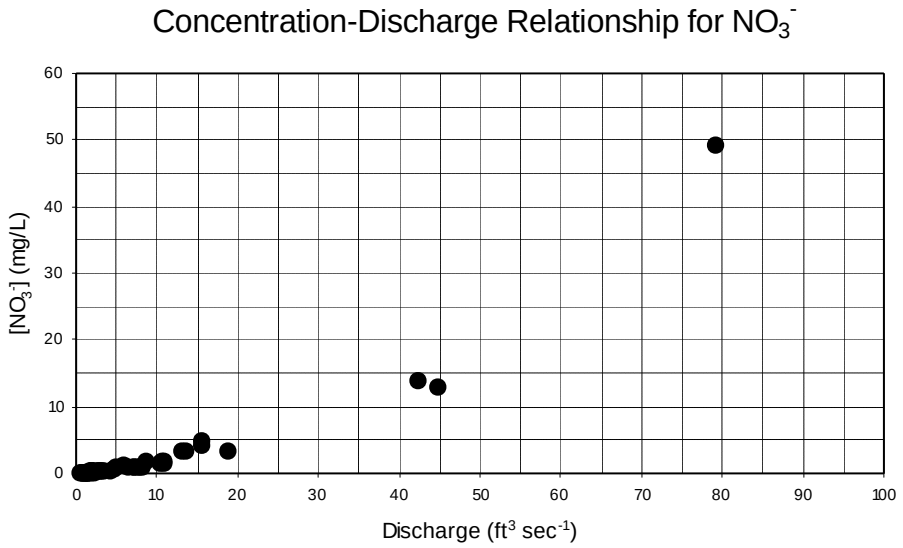
c. (10) Determine the standard error and coefficient of variation for phosphate.

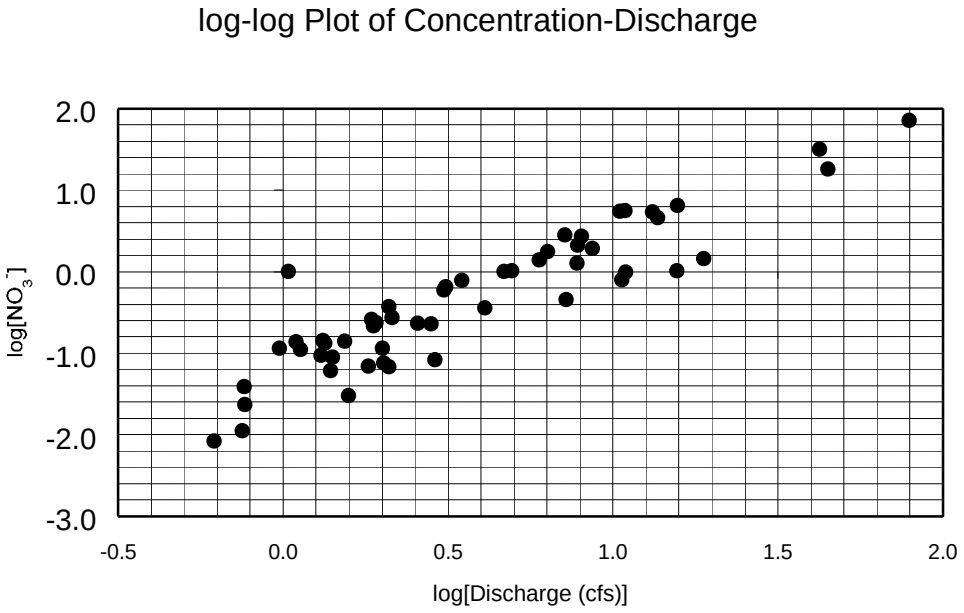
d. (15) Compute the 99% confidence interval for the mean phosphate concentration in the River Ouse during this 30-day period.

e. * (5) Estimate the conditional probability that the phosphate concentration is greater than 2 mg/L, given that the chloride concentration is greater than 65 mg/L.

f. * (5) Is the occurrence of phosphate concentrations greater than 2 mg/L independent of the occurrence of chloride concentrations greater than 65 mg/L? **Why or why not?**

2. (30 Points) The graphs below show the relationship between the concentration of nitrate [NO_3^-] in a stream, and stream discharge (or flow).





a. (15) Find a good straight-line relationship between log[NO_3^-] and log(discharge).

b. (10) From your answer to *a*, derive the relationship between [NO_3^-] and discharge.

c. (5) Use your answer to *b* to estimate the [NO_3^-] that would occur at a flow rate of 65 ft^3 sec^{-1}. Does your answer make sense?

3. (20 Points) If Z is a standard normal random variable, then determine:

a. (5) $P(0.58 = Z \leq 0.82)$.

b. (5) $P(Z > 1.59)$.

c. (5) The z value such that $P(Z > z) = 0.588$.

d. (5) The z value such that $P(z \leq Z \leq 1.26) = 0.75$.

Extra Credit (Max. Exam Score = 100)

4. (10 Points) Find the value of z such that $P(-2z = Z = z) = 0.6$