

CIE 272
Civil Engineering Measurements
Exam #3
December 21, 2009

Directions:

1. Write your name on this exam paper, NOW!
2. Read the questions carefully. Most errors on timed examinations are the result of not understanding what is being asked.

Good Luck, and Happy Holidays!

1. **(35 Points)** As you learned in this class, to make a topographic map it is necessary to estimate the elevation of unmeasured points by interpolation. Yanalak and Baykal (2001) proposed a method for doing this using GPS measurements. For a set of 51 measurement locations, they determined a mean absolute error of 3.8 cm, with a standard deviation of 4.8 cm.
 - a. (15) Test the hypothesis that the mean absolute error is less than 5.0 cm, using $\alpha = 0.05$.

b. (15) Find the 98% confidence interval for the absolute error.

c. (5) Estimate the confidence level that would yield a confidence interval of ± 1.5 cm (i.e., the interval of 2.8 to 4.8 cm).

2. (20 Points) Is “global warming” for real? The table below includes data for the annual mean global temperatures for the periods 1930-1950 and 1988-2008.

<i>Parameter</i>	<i>1930-1950</i>	<i>1988-2008</i>
Mean (°C)	13.924	14.326
Std. Deviation (°C)	0.108	0.135
N	21	21

Test the hypothesis that global temperature have risen. Use $\alpha = 0.01$, and assume equal variances. Is there a statistical basis for concluding that global warming is a real phenomenon?

3. (20 Points) True or False:

- a. (5) If H_0 is rejected, we conclude that the alternative hypothesis H_1 is true.

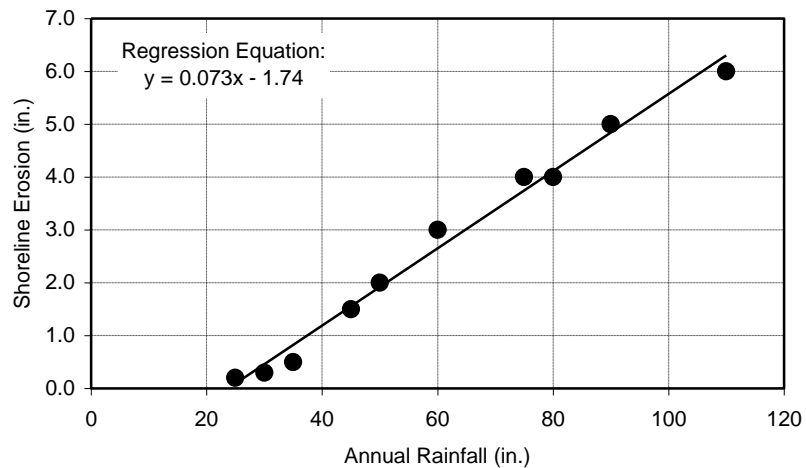
- b. (5) If H_0 is accepted, we conclude that H_0 is true.

- c. (5) The level of significance of a statistical test, α , equals the probability that the null hypothesis H_0 will be accepted when it is in fact false.

- d. (5) The correlation coefficient, r , measures the strength of the *linear* relationship between two variables.

2. (25 Points) A study was conducted to determine the relationship between the annual amount of rainfall (x) and the extent of shoreline erosion (y) along a coastal region. The data are tabulated and plotted below.

	Annual Rainfall (inches)	Shoreline Erosion (inches)	
	30	0.3	
	25	0.2	
	90	5.0	
	60	3.0	
	50	2.0	
	35	0.5	
	75	4.0	
	110	6.0	
	45	1.5	
	80	4.0	Regression Statistics
Mean	60.00	2.65	Total SS = 38.41
Std. Dev.	28.09	2.07	Error SS = 0.47
N	10	10	



- a. (5) How much shoreline erosion is expected to occur if the annual precipitation is 48 inches?

b. (10) Determine the coefficient of variation (R^2) and the correlation coefficient (r).

c. (10) Global climate change is expected to increase the annual rainfall in this region by an average of 3.7 inches in the next 50 years. Will this increase have an effect on shoreline erosion? If so, how much?