College of the Holy Cross, Spring Semester, 2018
MONT 101N – Analyzing Environmental Data, Final Exam
Tuesday, May 15

Your Name: _____

Instructions: Please show all work necessary to justify your answers, and write your answers in the spaces provided. Use the back of the preceding page if you need more space for scratch work. There are 100 possible points distributed as below.

Problem	Points/Poss
I	/ 20
II	/ 10
III	/ 20
IV	/ 25
V	/ 25
Total	/100

Have an enjoyable and productive summer!

I. *Briefly* identify *any 4* of the following. If you submit answers for more than 4, the best 4 will be counted.

(A) (5) The Central Limit Theorem

(B) (5) A 95% confidence interval for a population mean

(C) (5) A t-distribution

(D) (5) Standard normal distribution

(E) (5) The box-and-whisker plot of a data set.

(F) (5) The p-value of a test of hypotheses

II. Short answer

(A) (5) If you want to get polling results with comparable accuracy, do you need a bigger sample size if the polling is done in Texas than you do if the polling is done in Delaware? Explain by using formula for the standard error for a percentage.

(B) (5) True/False and explain: If the p-value of a hypothesis test works out to $p = .034$ then we can say that the null hypothesis was *definitely false*.

III. Let X represent a normal random variable with $\mu = 4.3$ and $\sigma = 1.4$.

(A) (10) Find $P(3.2 < X < 5.0)$

(B) (10) Suppose that values of X are sampled $n = 10$ times independently. Give the *formula for computing* the probability that exactly 5 out of the 10 values satisfy $3.2 < X < 5.0$. (The number the correct formula gives is roughly .2434 if you want to check your answer by computing the value.)

IV. A Gallup poll released on April 3, 2017 surveyed a random sample of 706 adults nationwide. It reported "that 59% of those sampled say the environment should be prioritized over energy production."

(A) (20) Find the 95% confidence interval for the actual percentage of Americans who feel this way. (Use the conservative method for estimating the standard error.)

(B) (5) Based on your answer to part (A), is 55% a "believable" value for the percentage of all Americans who feel that way?

V. (25) A study was conducted by the Florida Game and Fish Commission to assess the amounts of chemical residues found in the brain tissue of brown pelicans. In a test for the pesticide DDT, random samples of $N_1 = 10$ juveniles (young birds foraging independently) and $N_2 = 13$ nestlings (birds still being fed by their parents) produced the following data (DDT measurements in parts per million). Test the alternative hypothesis that mean amounts of DDT found in juveniles and nestlings differ versus the null hypothesis that they do not differ. Use $\alpha = 0.05$.

Juveniles	Nestlings
$N_1 = 10$	$N_2 = 13$
$\overline{Y}_1 = .041$	$\overline{Y}_2 = .026$
$S_1 = .017$	$S_2 = .006$

(Notes: This data has important implications regarding the accumulation of chemical residues over time. You may assume that the population SD's are equal to the sample SD's in deciding how to set up the test.)