ISYE435/535 Exp Design For Engineering
Assignment 1
Due date: February 13, 2026
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Instructions: Do not consult anybody. Be brief and precise. I NEED TO SEE YOUR WORK! You MUST provide assumptions, formulas, graphs, flowcharts and reasoning for each situation. PUT YOUR NAME ON ALL PAGES AND NUMBER EACH PAGE.

Problem 1: The weight of snack packages produced by a food processing line is being analyzed. Twelve packages are randomly selected from the production process, and their weights are recorded in grams as follows: 249.6, 250.4, 249.9, 250.1, 249.7, 250.3, 249.8, 250.2, 250.0, 249.5, 250.6, 249.9 (Don't use Minitab, do it manually).

a. Calculate the sample mean package weight.

b. Calculate the sample variance and standard deviation.

c. Construct a normal probability plot using the data. Based on the plot, determine whether the package weights appear to be normally distributed.

d. Construct a 95% confidence interval for the population mean package weight. Based on this interval, would you reject the null hypothesis that the true mean weight is 250 grams?

Problem 2: The diameter of a ball bearing was measured by 12 inspectors, each using two different kinds of calipers. The results are as follows:

Inspector	Caliper 1	Caliper 2
1	0.265	0.264
2	0.265	0.265
3	0.266	0.264
4	0.267	0.266
5	0.267	0.267
6	0.265	0.268
7	0.267	0.264
8	0.267	0.265
9	0.265	0.265
10	0.268	0.267
11	0.268	0.268
12	0.265	0.269

(a) Is there a significant difference between the means of the population of measurements from which the two samples were selected? Use $\alpha = 0.05$.

(b) Find the P-value for the test in part (a).

(c) Construct a 95 percent confidence interval on the difference in mean diameter measurements for the two types of calipers.

Problem 3: Two machines are used for filling plastic bottles with a net volume of 16.0 ounces. The filling processes can be assumed to be normal, with standard deviations of σ_1 = 0.015 and σ_2 = 0.018. The quality engineering department suspects that both machines fill the same net volume, whether this volume is 16.0 ounces. An experiment is performed by taking a random sample from the output of each machine.

Machine 1		Machine 2	
16.03	16.01	16.02	16.03
16.04	15.96	15.97	16.04
16.05	15.98	15.96	16.02
16.05	16.02	16.01	16.01
16.02	15.99	15.99	16.00

(a) State the hypotheses that should be tested in this experiment.

(b) Test these hypotheses using α = 0.05. What are your conclusions?

(c) Find the P-value for this test.

(d) Find a 95 percent confidence interval on the difference in mean fill volume for the two machines.