
KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
DEPARTMENT OF MATHEMATICS & STATISTICS
DHAHRAN, SAUDI ARABIA

STAT 319: Probability & Statistics for Engineers & Scientists

Semester 151

Third Major Exam

Wednesday Nov 25, 2015

Please encircle your instructor name:

Abbas

Al-Sawi

Anabosi

Malik

Riaz

Samouh

Name:

ID#:

Section #:

| Question No | Full Marks | Marks Obtained |
|--------------|------------|----------------|
| 1 | 07 | |
| 2 | 09 | |
| 3 | 12 | |
| 4 | 07 | |
| Total | 35 | |

Q.1:(6+1 = 7 points)

In the air pollution study performed at an experiment station, it is claimed that the true mean amount of suspended benzene-soluble organic matter is not less than $2.5 \mu\text{g}/\text{m}^3$.

The following amount of suspended benzene-soluble organic matter (in micrograms per cubic meter) were obtained for eight different samples of air. These measurements (X) are given below:

X: 2.2, 1.8, 3.1, 2.0, 2.4, 2.0, 2.1, 1.2

The descriptive measures for the dataset are: mean=2.1, standard deviation=0.54

Use this information to answer the following questions.

- a. Using the p-value approach, test the claim at a 2.5% level of significance. (State your hypotheses and show other necessary steps of testing).

- b. Write the assumption(s) if (any) to test your hypotheses for part (a) above.

Q.2:(7+2 = 9 points)

It is claimed that the resistance of electric wire can be reduced by more than 0.05ohm by alloying. To test the claim, 32 values obtained for standard wire had a mean 0.136 ohm and a standard deviation 0.004

ohm, and 17 values obtained for alloyed wire had a mean 0.083 ohm and a standard deviation 0.005 ohm.

- a. Do the data support the claim? Use critical value approach to test the said claim at 5% level of significance.(State your hypotheses and show other necessary steps of testing)

- b. Write the assumption(s) if (any) to test your hypotheses for part (a) above.

Q.3:- (4+1+4+3 = 12 points)

A random sample of 50 suspension helmets used by motorcycle riders and automobile race-car drivers was subjected to an impact test, and on 18 of these helmets some damage was observed.

- a. Find a 95% two-sided confidence interval on the true proportion of helmets of this type that would show damage from this test.

- b. Interpret the interval you obtained in part (a)

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- c. Using the point estimate of p obtained from the preliminary sample of 50 helmets, how many helmets must be tested to be 95% confident that the error in estimating the true value of p is less than 0.02?
- d. How large must the sample be if we wish to be at least 95% confident that the error in estimating p is less than 0.02, regardless of the true value of p ?

Q.4:- (3+4=7points)

- a) Following are two confidence interval estimates of the mean μ of the cycles to failure of an automotive door latch mechanism (the test was conducted at an elevated stress level to accelerate the failure).

$$3124.9 \leq \mu \leq 3215.7 \quad 3110.5 \leq \mu \leq 3230.1$$

The confidence level for one of these CIs is 95% and the confidence level for the other is 99%. Both CIs are calculated from the same sample data. Which is the 95% CI? Explain why.

- b). A manufacturer is interested in the output voltage of a power supply used in a PC. Output voltage is assumed to be normally distributed with standard deviation 2 volts, and the manufacturer wishes to test $H_0: \mu \geq \mu_0$ against $H_1: \mu < \mu_0$. A sample of size 16 is selected and the sample mean is found to be 20.41 volts. After testing the above mentioned hypotheses, the manufacturer got p-value = 0.119. Find the value of μ_0 .