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
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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 $\mu g/m^3$.
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)

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).

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

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.