Assignment 10

IC252 - IIT Mandi

Submission Deadline: 2 June, 2021

1. Continuation of the example in Slides 8-9 of Lecture 31: The average zinc concentration recovered from a sample of measurements taken in 36 different locations in a river is found to be 2.6 grams per milliliter. Find the 99% confidence intervals for the mean zinc concentration in the river. Assume that the population standard deviation is 0.3 gram per milliliter. **[2]**

2. An electrical firm manufactures light bulbs that have a length of life that is approximately normally distributed with a standard deviation of 40 hours. If a sample of 30 bulbs has an average life of 780 hours, find a 96% confidence interval for the population mean of all bulbs produced by this firm. **[2]**

3. Suppose that, in a biomedical study, 10 rats are injected with cancer cells and then given a cancer drug that is designed to increase their survival rate. The survival times, in months, are 14, 17, 27, 18, 12, 8, 22, 13, 19, and 12. Assume that the exponential distribution applies. Find the maximum likelihood estimate of the mean survival time. **[4]**

   Hints: (1) The numbers 14, 17, 27, 18, 12, 8, 22, 13, 19, and 12 represent a sample $x_1, \ldots, x_{10}$. (2) the survival time is exponentially distributed Exp(λ). (3) First find the general expression for the maximum likelihood estimate of λ and then plug-in the values of the sample to obtain the numerical estimate.

4. The standard deviation of test scores on a certain achievement test is 11.3. If a random sample of 81 students had a sample mean score of 74.6, find a 90% confidence interval estimate for the average score of all students. **[2]**