**Sabaragamuwa University of Sri Lanka**
**Faculty of Geomatics**
**Department of Surveying and Geodesy**

FC21342
Inferential Statistics and Numerical Methods
Year II Semester I - 2022

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**Continuous Assessment 01 (CA-01) - Assignment**
**Deadline for submission is September 19, 2022**

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**1.** Let $X_1, X_2, ..., X_n$ denote a random sample from $Uniform(0, \theta)$ distribution with $\theta > 0$ as the unknown parameter. Let $\bar{X}$ denote the sample mean.

(a) Write down the distribution and verify that it is a probability density function (pdf).

(b) Is $\bar{X}$ unbiased for $\theta$? Explain.

(c) Find an unbiased estimator.

(d) Find the variance of the estimator obtained in part (c) above.

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**2.** Consider the following results of 10 tosses of a coin.

H T T T T H T H T T

(a) Estimate the probability of head (H) for this coin.

(b) Estimate the standard error of your estimate.

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**3.** A sample of three observations ($X_1 = 0.4$, $X_2 = 0.7$ and $X_3 = 0.9$) is collected from a continuous distribution with probability density function (pdf).

$$f(x, \theta) = \theta x^{(\theta-1)}; 0 < x < 1$$

(a) Estimate $\theta$ by the method of moments.

(b) Estimate $\theta$ by the method of maximum likelihood estimation.

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**4.** Suppose that the following data shows the numbers of the problems of tutorial attempted by the last year students by randomly select 10 students.

2 4 0 7 1 2 0 3 2 1

(a) Find the sample mean and variance.

(b) Estimate the mean and the standard error of the mean.

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**5.** Suppose $X_1, X_2, ..., X_n$ are iid random sample (variable) obtained from a random variable $X$ of a population of poisson distribution with parameter $\lambda$.

(a) Write down the probability density function (pdf) of $X$.

(b) Find the bias of the estimator $\bar{X}$ for parameter $\lambda$.

(c) Find the mean squared error of $\bar{X}$ as an estimator of $\lambda$.

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