

WEST BENGAL STATE UNIVERSITY
B.Sc. General 1st Semester Examinations, 2018
STSHGEC01T/ STSGCOR01T- STATISTICS (GE1/DSC1)
Basics of Statistical Inference

Time Alloted: 2 Hours

Full Marks : 40

Answer any *four* questions from the following:

$5 \times 4 = 20$

- (1) If $x_1, x_2, \dots, x_n$ is a random sample from an infinite population with variance σ^2 , and $\bar{x}$ is the sample mean, show that $\sum_{i=1}^n \frac{(x_i - \bar{x})^2}{n}$ is a biased estimator of σ^2 , but the bias becomes negligible for large n . Give an unbiased estimator of σ^2 . 2 + 1 + 2
- (2) If T_1, T_2, T_3 are independent, unbiased estimates of θ and all have the same variance, which of the following unbiased estimates of θ would you prefer? $\frac{T_1 + 2T_2 + T_3}{4}$, $\frac{2T_1 + T_2 + 2T_3}{5}$, $\frac{T_1 + T_2 + T_3}{3}$.
- (3) Derive a $100(1 - \alpha)\%$ confidence interval for the ratio $\frac{\sigma_1^2}{\sigma_2^2}$, where σ_1^2 and σ_2^2 are the variances of two normal distributions.
- (4) For a given coin, it is known that p is either $\frac{1}{2}$ or $\frac{2}{3}$, p being the probability of occurrence of head. To test $H_0 : p = \frac{1}{2}$ against $H_1 : p = \frac{2}{3}$, H_0 is rejected if more than 3 heads are obtained out of 5 throws of the coin. find the probability of type I error.
- (5) Describe three basic principles of design of experiment.
- (6) Write down the analysis of variance table for two-way classified data.

Answer any *two* from the following questions:

$2 \times 5 = 10$

- (7) Describe the technique of analysis of variance in one-way classified data stating clearly the mathematical model and the assumptions you make by giving analysis of variance table.
- (8) Describe test for independence of two attributes A and B having three and four levels respectively. Describe Yate's correction for 2×2 contingency table. 5 + 5
- (9) Describe Wilcoxon two-sample test for testing difference in mean between two populations by clearly stating assumption, construction of test statistic, null distribution and rejection region.
- (10) (i) Discuss simple and composite hypotheses, type I and type II errors and level of significance in testing of hypothesis.
(ii) Describe the testing procedure for testing the null hypothesis $H_0 : \mu = 50$ against all possible alternatives for a normal($\mu, 2^2$) distribution. 5 + 5