Oct-2015

B.Sc. Semester VI
Statistics Paper ST 602
(Statistical Inference II) – 4626
Total Marks: 70
Duration of Time: $2\frac{1}{2}$ Hours.

Instructions: There are Five Compulsory questions in this question-paper. All questions carry equal marks. Statistical Tables and graph-papers will be provided upon request. Use of a scientific calculator is permitted.

Q 1 (a) Explain the following terms: 06
(1) Point Estimation and Interval Estimation
(2) Confidence Interval and its width.

(b) Describe the full procedure of constructing a $100(1-\propto)$ % confidence interval for the difference of two means $\mu_1 - \mu_2$ based on independent random samples of sizes n_1 and n_2 from $N(\mu_1, \sigma^2)$ and $N(\mu_2, \sigma^2)$ respectively. 08

OR

Q 1 (a) Define the following terms: 06
(1) Random Interval (2) Confidence Coefficient
(3) Pivotal Quantity.

(b) Derive a $100(1-\alpha)$ % confidence interval for the mean of a normal population when its standard deviation is also unknown. If $x_1, x_2 \ldots x_{10}$ is an observed random sample from a normal prob. distribution $N(\mu, \sigma^2)$ with $\sum x_i = 360$ and $\sum (x_i - \bar{x})^2 = 8100$ find a 90 % confidence interval for μ 08

Q 2 (a) Explain the general method of constructing a confidence interval. 09

(b) Test whether the following arrangement of H's and P's could be regarded as random at 0.05 LOS. 05

HHHHPPHHHPPPPPPHHHHHPHHHPPPPPPHP

OR

Q 2 (a) Explain the procedure of constructing a $100(1-\propto)$ % confidence Interval for the ratio of variances of two normal populations whose means are different and also unknown. 08

(b) Given 3.6, 4.9, 5.2, 3.7, 4.3, 5.4, 4.2 are observations of an observed random sample from a normal population $N(\mu, \sigma^2)$, construct a 90% equal tails confidence interval for σ. 06

Q 3 (a) Justify the following:

(1) Any Critical Region completely determines the test of hypotheses H_0 against H_1. 06

(2) Type I Error is considered to be more serious than Type II Error.

(b) If $X_1, X_2, \ldots\ldots X_{16}$ is a random sample from a $N(\mu, \sigma^2=36)$ and $C = \{ (x_1, x_2 \ldots\ldots x_{16}) \mid \bar{x} \geq 78 \}$ is a critical region to test $H_0: \mu = 75$ against $H_1: \mu > 75$, evaluate the significance level and probabilities of Type II error at $\mu = 76$ and $\mu = 79$. 08

OR

Q 3 (a) State the differences between 06

(1) Simple Hypothesis and Composite Hypothesis

(2) Null Hypothesis and Alternative Hypothesis

(3) Level of Significance and Size of the test.

(b) Given $X_1. X_2 \ldots\ldots X_6$ is a random sample of size 6 from a Bernoulli Probability Distribution with the probability function

$$f(x,\theta) = \theta^x (1-\theta)^{1-x} \quad x = 0,1 \quad \theta \in \{\tfrac{1}{2}, \tfrac{2}{5}\}$$ 08

$$= 0 \quad \text{Elsewhere.}$$

Find the probabilities of Type I Error and Type II Error of the CR $C = \{(x_1, x_2, \ldots\ldots x_6) \mid \sum x_i \leq 2\}$ is used to test $H_0: \theta = \frac{1}{2}$ against $H_1: \theta = \frac{2}{5}$.

Q 4 (a) State and Prove the Neyman-Pearson theorem to get a Best Critical Region of the level of significance $\propto$ to test a simple Null hypothesis against a simple Alternative hypothesis. 09

(b) Obtain a Best Critical Region of LOS $\propto$ to test $H_0: \mathrm{p} = p_0$ against $H_1: \mathrm{p} = p_1$ (where $p_1 > p_0$) based on a random sample of a Poisson Probability distribution with mean p. 05

OR

Q 4 (a) Define a UMP test of size $\propto$. Find a UMP test of the Level of Significance $\propto$ to test $H_0: \theta = \theta_0$ against $H_1: \theta > \theta_0$ Based on a random sample of size n from an Exponential Probability Distribution with mean θ. 08

(b) Explain Kolmogorov – Smirnov one sample test covering purpose, Method, test statistic and decision. 06

Q 5 (a) What are the non-parametric methods ? Explain their advantages over the parametric methods. 08

(b) Based on the following paired observations of two dependent Samples, test whether their medians have significant statistical difference using sign test at LOS 0.05. 06

Sample 1	Sample 2
36.3	43.2
28.5	31.3
45.4	45.4
38.9	40.1
27.5	22.4
19.2	24.6
36.7	36.6
21.6	22.3
34.2	31.6
46.9	47.4
33.3	39.2

OR

Q 5 (a) Explain the Mann-Whitney test fully for two independent samples. Compare it with the parametric t test. 08

(b) Describe the procedure of Wilcoxon signed ranks test and explain its superiority over sign test. 06