Seat No. : _______________

LE-106

April-2014

B.Sc. Semester – VI

CC-308 : Statistics

(Statistical Inference)

Time : 3 Hours] **[Max. Marks : 70**

Instructions : (i) Attempt **all** questions.
(ii) Each question carries equal marks.

1. (a) Define most powerful test. State and prove Neymann-Pearson lemma for obtaining most powerful test. **7**

OR

Let $X_1, X_2, X_3, \ldots, X_n$ be a random sample from normal population with mean μ and variance σ^2. Test for μ when σ is known. Obtain best critical region for testing $H_0 : \mu = \mu_0$ Vs. $H_1 : \mu = \mu_1$. Where $\mu_1 < \mu_0$

(b) Given the p.d.f. $f(x, \theta) = \frac{1}{\theta}$, $0 < x < \theta$ **7**

$= 0$ otherwise.

Suppose we want to test $H_0 : \theta = 1.5$ vs. $H_1 : \theta = 2.5$ by means of a single observed value of x. Obtain the size of the type-I and type-II errors, if you choose $0.8 \leq x$ as the critical region. Also, find power function of the test.

OR

Let x follows Binomial distribution with parameters n and p. Where n = 5. Suppose we wish to test the hypothesis $H_0 : p = ½$ against $H_1 : p = ¾$. Obtain most powerful critical region at (i) $\alpha = 1/32$ and (ii) $\alpha = 6/32$

2. (a) Describe likelihood ratio test. **7**

OR

Let $X_1, X_2, X_3, \ldots, X_n$ be a random sample of size n from $N(\mu, \sigma^2)$, where μ and σ^2 are unknown. Obtain likelihood ratio test for testing $\mu = \mu_0$ Vs. $\mu \neq \mu_0$.

(b) Let $X_1 \sim N(\mu_1, \sigma_1^2)$ and $X_2 \sim N(\mu_2, \sigma_2^2)$, where $\sigma_1^2 = \sigma_2^2 = \sigma^2$. Derive likelihood ratio test for the equality of means of two normal populations. **7**

OR

Let $X_1, X_2, X_3, \ldots, X_n$ be a random sample of size n from $N(\mu, \sigma^2)$. Describe the test for testing the hypothesis $H_0 : \sigma^2 = \sigma_0^2$ (specified) Vs. $H_1 : \sigma^2 \neq \sigma_0^2$.

3. (a) What is meant by non-parametric tests ? Clear the difference between parametric and non-parametric test. **7**

OR

Explain Wilcoxon's signed rank test in detail.

(b) Use sign test at 5% level of significance for testing the null hypothesis that the samples given are drawn from the same population : **7**

Sample – 1	10.6	5.3	11.8	7.6	10.8	12.3	6.3	7.2	10.6
Sample – 2	9.3	3.4	13.9	11.4	10.4	11.7	4.2	9.3	8.7

OR

The following are the weight gains (in pounds) of two random samples of young birds fed two different diets and other conditions were kept identical :

Diet - 1	16.3	10.1	10.7	13.5	14.9	11.8	14.3	12	14.7	23.6	15.1	14.5	18.4	13.2	14	10.2
Diet – 2	21.3	23.8	15.4	19.6	12	13.9	18.8	15.3	20.1	14.8	18.9	20.7	21.1	15.8	16.2	19.2

Use U-test at 0.01 level of significance to test the null hypothesis that the two populations sampled are identical against that on the average the second diet produces a greater gain in weight.

4. (a) Give complete statistical analysis of m×m Latin square design. **7**

OR

Explain randomized block design in detail.

(b) Why confounding technique is adopted in factorial experiment ? Explain partial confounding in 2^3 factorial experiments. **7**

OR

What is factorial experiment ? Construct 2^2 factorial experiment and explain its analysis.

5. Answer the following objectives : **14**

(1) Define statistical hypothesis and its types.

(2) State any two characteristics of likelihood ratio test.

(3) State any two advantages of factorial design.

(4) Give statistical formulae for the efficiency of LSD over RBD and CRD.

(5) State any two applications of non-parametric tests.

(6) State the assumptions for applying non-parametric tests.

(7) Define contrast and orthogonal contrast in factorial design.