

Exam. Code : 211004
Subject Code : 4920

M.Sc. (Mathematics) 4th Semester (Batch 2020-22)

MATH-587 : STATISTICS—II

Time Allowed—3 Hours] [Maximum Marks—100

Note :— Attempt *five* questions in all, selecting at least *one* question from each section. The *fifth* question may be attempted from any section. All questions carry equal marks.

SECTION—A

1. (a) Define t-statistic and derive its probability density function. What are the requirements for t to be a sampling distribution ?
- (b) What is the relationship between t and F statistics ? Discuss in detail. 14,6
2. (a) Define order statistics. Derive the joint distribution of i^{th} and j^{th} ($i < j$) order statistics under the assumption of sampling from continuous distribution.
- (b) Derive the distribution of sample range in the continuous case. 10,10

SECTION—B

3. (a) Discuss the properties of a good estimator.
- (b) Define a sufficient statistic.
- (c) Let X_1, \dots, X_n be a random sample from a normal distribution with mean μ and variance σ^2 . Derive the sufficient statistic for (μ, σ^2) . 8,4,8

4. (a) Define the likelihood estimator.
- (b) Let X_1, \dots, X_n be a random sample from uniform distribution over the interval $(0, \theta)$. Find likelihood estimator of θ .
- (c) Define :
- (i) p-value
 - (ii) Composite hypothesis
 - (iii) UMP test
 - (iv) Complete statistic. 4,8,8

SECTION—C

5. (a) Define and discuss likelihood ratio method used in hypothesis testing.
- (b) Derive likelihood ratio test for testing the hypothetical value of variance of normal distribution. 8,12
6. (a) Discuss the test procedure to test the equality of two population proportions by taking all the three types of alternative hypotheses.
- (b) Define F-statistic. What are its applications ?
- (c) What are the applications of t-test ? 8,6,6

SECTION—D

7. (a) Define ANOVA. What are its assumptions ?
- (b) Discuss the model, analysis and test procedure in two-way ANOVA with one observation per cell. 8,12
8. (a) Define Gauss Markoff linear model. Derive the least square estimator of parametric vector in this model. Show that this estimator is unbiased. Also derive its variance.
- (b) Show the uniqueness property of least square estimator of parameter vector of Gauss-Markoff linear model. 12,8