H.P.A.S. (Main)—2011

STATISTICS

Paper II

Time : 3 Hours

Maximum Marks : 150

Note :— Attempt Question No. 1 which is compulsory and
four questions from the rest, in all five. All
questions carry equal marks.

1. (a) In testing of hypotheses problem, explain critical
region, size of a test and the power of a test.

(b) Obtain the test of significance of the variance of
a normal distribution.

(c) Distinguish between sampling and non-sampling
errors.
2. (a) If \( x \geq 1 \) is the critical region for testing 

\[ H_0 : \theta = 2 \text{ against the alternative } H_0 : \theta = 1 \]

on the basis of a single observation \( x \) from the distribution:

\[ f(x, \theta) = \theta e^{-\theta x} \quad (0 \leq x \leq \theta) \]

obtain the values of type I and II errors.

(b) Eleven pairs of observations from a bivariate normal distribution have value of the sample correlation coefficient 0.6. Test for the significance of this value:

\[ [t \text{ on } 9 \text{ d.f.} = 2.26]. \]

3. (a) State Neyman-Pearson Lemma and give its use in finding best test for a simple hypothesis against a simple alternative.
(b) Construct a likelihood ratio test for $H_0: \sigma^2 = \sigma_0^2$ against $H_1: \sigma^2 \neq \sigma_0^2$ in a normal distribution $N(\mu, \sigma^2)$.

4. (a) Distinguish between parametric and non-parametric tests. What are latter's advantages?

(b) Explain the Mann-Whitney test.

5. (a) Briefly describe the advantages of sampling over complete enumeration.

(b) What are proportional and optimum allocations in stratified random sampling? Compare their efficiencies.

6. (a) Write a note on the ratio method of estimation.

(b) Write a note on systematic sampling.

P.T.O.
7. (a) Explain the principles of replication and local control in design of experiments.

(b) Explain:

(i) underlying assumptions and
(ii) interaction in analysis of variance.

8. (a) Explain the analysis of a Latin Square design.

(b) In a $\gamma \times \gamma$ Latin square design, describe how a missing plot is estimated.