PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)
BSc DEGREE EXAMINATION MAY 2019
(Fourth Semester)

Branch – STATISTICS

<u>STATISTICAL INFERENCE - I</u>

Time : Three Hours   Maximum : 75 Marks

<u>SECTION-A (20 Marks)</u>
Answer **ALL** questions
ALL questions carry **EQUAL** marks   (10 x 2 = 20)

1. What are the characteristics of estimators?

2. Define efficiency.

3. State the factorization theorem.

4. State the invariance property of sufficient estimator.

5. Define likelihood function.

6. Write any two properties of the method of Moments.

7. Define Sampling distribution.

8. What is meant by standard error?

9. Define order statistics.

10. Define Non Parametric test.

<u>SECTION - B (25 Marks)</u>
Answer **ALL** Questions
ALL Questions Carry **EQUAL** Marks (5 x 5 = 25)

11 a   If T is an unbiased estimator for θ, show that T^2 is a biased estimator for θ^2.

         OR

  b   Explain consistency and give an example.

12 a   Let $x_1, x_2, \ldots x_n$ be a random sample from $N(\mu, \sigma^2)$ population. Find sufficient estimators for μ and σ^2.

         OR

  b   Let $x_1, x_2, \ldots x_n$ be a random sample from Cauchy population $f(x, \theta) = \frac{1}{\pi} \frac{1}{1+(x-\theta)^2}, -\infty < x < \infty ; -\infty < \theta < \infty$ Examine if there exists a sufficient statistic for θ.

13 a   Describe the method of moments.

         OR

  b   What modification in minimum chi-square (χ^2) method of estimation gives rise to the method of modified minimum chi-square?

14 a   Explain the properties of χ^2 - chi square distribution.

         OR

  b   Ten measurements of a physical constant gave a mean of 123.68 units and the sum of the squares of their deviations from the mean is 0.9321. Obtain the 95% and 99% confidence limits for the mean of the population.

15 a   Explain the advantages and disadvantages of non parametric methods.

                                       OR

     b   The following data show the employee's rates of defective work before and after a change in the wage incentive plan. Compare the following two sets of data to see whether the charge lowered the defective units produced. Using the sign test with $\alpha = 0.01$.

Before:	8	7	6	9	7	10	8	6	5	8	10	8
After:	6	5	8	6	9	8	10	7	5	6	9	8

SECTION - C (30 Marks)
Answer any **THREE** Questions
ALL Questions Carry **EQUAL** Marks (3 x 10 = 30)

16   Obtain 100 $(1-\alpha)$% confidence limits (for large samples) for the parameter λ of the Poisson distribution.

17   Let X_1, X_2,..., X_n be a random sample from a population with p.d.f $f(x, \theta) = \theta x^{\theta-1}$. Show that $t_1 = \prod_{i=1}^{n} x_i$ is sufficient for θ, $0 < x < 1, \theta > 0$.

18   A sample of 900 members has a mean 3.4 cm and standard deviation 2.61 cm. Is the sample from a large population of mean 3.25 cm and S.D. 2.61 cm. If the population is normal and the mean is unknown, find the 95% confidence limits for the mean.

19   Drive the method of minimum variance.

20   In an industrial production line items are inspected periodically for defectives. The following is a sequence of defective items (D) and non-defective items (N) produced by these production line

DD NNN D NN DD NNNNN DDD NN D NNN D N D

Test whether the defectives are occurring at random or not at 5% level of significance.

Z-Z-Z   END