10. The _______ is a non-parametric test to the t-test for related samples
(i) unbiased test (ii) Sign test
(iii) Run test (iv) Mann-Whitney U test

SECTION - B (35 Marks)
Answer **ALL** Questions
ALL Questions Carry **EQUAL** Marks (5 x 7 = 35)

11. a. State and prove invariance property of consistent estimators.
(Or)
b. Prove that an minimum variance unbiased estimators is unique if T_1 and T_2 are minimum variance unbiased estimators for $\gamma(\theta)$, then $T_1 = T_2$, almost surely.

12. a. Let $x_1, x_2, \dots, x_n$ be a random sample from a uniform population over $[0, \theta]$. Find the sufficient statistic for θ.
(Or)
b. State and prove Rao Blackwell theorem.

13. a. Find the maximum likelihood estimator for the parameter λ of a Poisson distribution on the basis of a sample of size n . and obtain its variance.
(Or)
b. Describe the method of moments for estimating the parameters.

14. a. Write short notes on prior and posterior distribution with an suitable example
(Or)
b. Obtain $100(1-\alpha)\%$ confidence intervals for (small samples) the parameter θ of the normal distribution.

15. a. Define probability density function of single order statistic Distribution of range.
(Or)
b. Explain Mann Whitney U test?

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

16. State and prove Cramer Rao inequality.

17. State and prove Neymann Factorization theorem.

18. In random sampling from normal population $N(\mu, \sigma^2)$, find the maximum likelihood estimators for (i) μ when σ^2 is known (ii) σ^2 when μ is known (iii) the simultaneous estimation of μ and σ^2.

19. A random sample of 16 is taken from a normal population showed a mean of 41.5 inches and the sum of squares of deviations from this mean equal to 135 square inches. Show that the assumption of a mean is 43.5 inches for the population is not reasonable. Obtain 95% and 99% confidence limit for the pollution is reasonable or not..
$(given\ t_{0.05} for\ 15 d.f = 2.131\ and\ t_{0.01} for\ 15 d.f = 2.947)$

20. Explain chi-square test for goodness of fit.

Z-Z-Z END

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2022
(Fourth Semester)

Branch – **STATISTICS**

BASIC SAMPLING THEORY

Time: Three Hours Maximum: 75 Marks

SECTION-A (10 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks (10 x 1 = 10)

1. In SRSWOR the estimation of population total $\hat{Y}$ with n samples is ________.

   (i) $\frac{\bar{Y}}{N}$ (ii) $N\bar{y}$ (iii) $\frac{\bar{y}}{n}$ (iv) $\frac{N}{n}\bar{y}$

2. Sample is regarded as the subset of______.

   (i) data (ii) set (iii) distribution (iv) population

3. The difference between the actual value of the parameter and estimated value $\bar{y}_n$ provided by the sample is called _____.

   (i) sum of error (ii) margin of error
   (iii) mean square error (iv) standard error

4. The probability of selecting a unit in the 5^{th} draw in SRSWOR of 12 units is_______.

   (i) 1/11 (ii) 1/5 (iii) 1/12 (iv)1/8

5. If the sample fraction is constant for each drawn then the allocation of n_i's to various strata is called _______.

   (i) Neyman allocation (ii) optimal allocation
   (iii) proportional allocation (iv) randomallocation

6. The estimated variance $v(\bar{y}_{st})$of the weighted mean from the stratified sampling is_____.

   (i) $\sum\frac{w_i^2 s_i^2}{n_i} - \sum\frac{w_i s_i^2}{N}$ (ii) $\sum\frac{w_i^2 s_i^2}{n_i}$
   (iii) $\sum\frac{w_i^2 s_i^2}{n_i} + \sum\frac{w_i s_i^2}{N}$ (iv) $\sum\frac{w_i^2 s_i^2}{n_i} + \sum\frac{w_i s_i^2}{n}$

7. The variance of the sample estimate of the population mean is inversely proportional to the _______.

   (i) population variance (ii) sample size
   (iii) sample mean (iv) sample error

8. Let N be the population units and n is the sample size then k, the sampling interval is equals to_______.

   (i) $\frac{N}{n}$ (ii) Nn (iii) $N - n$ (iv) $\frac{N}{n^2}$

9. Let x_i the auxiliary variate correlated with $y_i$then the ratio estimator of Y is______.

   (i) $\hat{Y}_R = \frac{x}{\bar{x}}$ (ii) $\hat{Y}_R = \bar{y}\bar{x}$ (iii) $\hat{Y}_R = \frac{\bar{y}}{\bar{x}}X$ (iv) $\hat{Y}_R = \frac{\bar{y}\bar{x}}{\bar{X}}$

10. In simple random sampling in which b_0 is a preassigned constant the linear regression estimate $\bar{y}_{lr}$ =________.

    (i) $\frac{b_0(\bar{X}-\bar{x})}{\bar{y}}$ (ii) $\bar{y} - b_0(\bar{X} - \bar{x})$ (iii) $\bar{y} + b_0(\bar{X} - \bar{x})$ (iv) $\bar{y} + b_0\bar{x}$

Cont...