20MAU12

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2022
(Fourth Semester)

Branch – **MATHEMATICS**

MATHEMATICAL STATISTICS-II

Time: Three Hours Maximum: 75 Marks

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

1. Probability of drawing a unit at each selection remains same in
(i)Simple random sampling with replacement
(ii)Simple random sampling without replacement
(iii)Both (a) and (ii)
(iv)None of these

2. Stratified random sampling comes under the category of
(i)Unrestricted sampling (ii)Restricted sampling
(iii)Purposive sampling (iv)census method

3. Estimate and estimator are
(i)Same (ii)different (iii)normal (iv)None of these

4. If $X_1, X_2, \ldots, X_n$, is a random sample from a population $N(0, \sigma^2)$, the sufficient statistic for σ^2 is :
(i)ΣX_i (ii)ΣX_i^{2+n} (iii)$(\Sigma X_i)^2$ (iv)ΣX_i^2

5. If the sample mean $\bar{x}$ is an estimate of population mean μ, then $\bar{x}$ is _____
(i)Unbiased and efficient (ii)Unbiased and inefficient
(iii)biased and efficient (iv)Biased and inefficient

6. If $X_1, X_2, \ldots, X_n$, is a random sample from a population $\frac{1}{\theta\sqrt{2\pi}}\, e^{-x^2/2\theta^2}$ the maximum likelihood for θ is _____
(i)$\Sigma X_i/n$ (ii)$\Sigma X_i^2/n$ iii)$\sqrt{\sum X_i^2}\ /n$ (iv)$\sqrt{\sum X_i^2/n}$

7. Whether a test is one sided or two sided depends on
(i)Null hypothesis (ii) Alternative hypothesis
(iii)composite hypothesis (iv)simple hypothesis

8. Level of significance is the probability of
(i)Type I error (ii)Type II error (iii)power of the test (iv)both (a) and (b).

9. Student's t - test is applicable only when
(i)the variate value are independent (ii)the variable is distributed normally
(iii)the sample is not large (iv)all the above

10. The ratio between sample variance and within sample variance following _____
(i)F - distribution (ii)t- distribution (iii)Z - distribution (iv)χ^2 distribution.

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

11.(a) Highlight the advantages of stratified sampling.

(or)

Cont...

(b) Fit a straight line by the method of least squares and tabulate the trend values for the following data.

Year	2011	2012	2013	2014	2015	2016	2017
Production (in Tones)	77	88	94	85	91	98	90

12.(a) Explain the characteristics of best estimators.

(or)

(b) State and prove that Rao-Blackwell theorem.

13.(a)Bring out the properties of maximum likelihood estimators.

(or)

(b) Briefly method of minimum variance unbiased estimate.

14. (a) Explain the following terms (i) statistical hypothesis and (ii) type I and type II errors.

(or)

(b) Briefly explain one sided and two sided tests and power of a test.

15.(a) Explain the test procedure of single mean for large samples.

(or)

(b) A sample of 26 bulbs gives a mean life of 990 hours with a S.D of 20 hours. The manufacturer claims that the mean life of bulbs is 1000 hours. Is the sample not up to the standard? Test whether 5% level of significance.

SECTION - C (30 Marks)

Answer any **THREE** Questions

ALL Questions Carry **EQUAL** Marks (3 x 10 = 30)

16. Describe the various method of drawing the simple random sample.

17. State and prove that Cramer- Rao inequality.

18. Explain the methods of moments.

19. Describe the procedure for testing of hypothesis.

20. Based on information on 1,000 randomly selected fields about the tenancy status of the cultivation of these fields and use the fertilizers, collected in agro economic survey, the following classification was noted:

	Owned	Rented	Total
Using fertilizers	416	184	600
Not Using fertilizers	64	336	400
Total	480	520	1000

Carryout Chi-square test as per testing procedure (for 5% value of χ^2 for one degree of freedom=3.84)

Z-Z-Z END