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(FOR THE CANDIDATES ADMITTED

DURING THE ACADEMIC YEAR 2022 ONLY)

22PMS206

REG.NO. :

N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI

END-OF-SEMESTER EXAMINATIONS : MAY - 2023

COURSE NAME: M.Sc.-MATHEMATICS MAXIMUM MARKS: 50

SEMESTER: II TIME : 3 HOURS

MATHEMATICAL STATISTICS

SECTION – A (10 X 1 = 10 MARKS)

ANSWER THE FOLLOWING QUESTIONS.
MULTIPLE CHOICE QUESTIONS. **K1**

1. If F(x) is a distribution function of the random variable X, then F (- ∞) = -----
   (a) 1 (b) -1 (c) 0 (d) ∞

2. If Xi's are n independent chi-square random variables with n_i degrees of freedom then $\sum x_i$ follows
   (a) $\chi^2_{(\sum n_i)}$ (b) $\chi^2_{(1)}$ (c) $\chi^2_{(n-1)}$ (d) $\chi^2_{(2n)}$

3. If an estimator T_n of population parameter $\boldsymbol{\theta}$ as n tends to infinity is said to be ______.
   (a)Sufficiency (b) efficiency (c) consistent (d) unbiased

4. If $\bar{x}$ is the value of the mean of a random sample of size $n$from a normal population with mean μ and variance $\boldsymbol{\sigma}^2$ then the 100(1-α)% confidence interval for mean of the population is___________.
   (a) $\bar{x} - z_{\frac{\alpha}{2}} < \mu < \bar{x} + z_{\frac{\alpha}{2}}$ (b) $\bar{x} - z_{\alpha} < \mu < \bar{x} + z_{\alpha}$
   (c) $\bar{x} - t_{\frac{\alpha}{2}} < \mu < \bar{x} + t_{\frac{\alpha}{2}}$ (d) $\bar{x} - t_{\alpha} < \mu < \bar{x} + t_{\alpha}$

5. A test based on a test statistic is classified as_________.
   (a) randomized test (b) non – randomized test
   (c) sequential test (d) Bayesian test

ANSWER THE FOLLOWING IN ONE OR TWO SENTENCES. **K2**

6. Define distribution function of a discrete random variable.
7. State any one of the properties of chi-square distribution.
8. When we say that an estimator is an ideal one?
9. Write the 100(1-α)% confidence interval for variance of normal population.
10. Explain level of significance.

SECTION – B (5 X 3 = 15 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS. **K3**

11.(a) Write the properties of distribution function.

(OR)

(b) Explain marginal distribution of joint probability distribution f(x,y).

(CONTD……2)

12. (a) Write short note on t-distribution.

(OR)

(b) Elucidate F distribution.

13. (a) State Cramer-Rao inequality.

(OR)

(b) Write the sufficient conditions for consistency.

14. (a) What do you understand one-sided confidence interval.

(OR)

(b) If X is a binomial random variable with the parameters n and $\boldsymbol{\theta}$,then write The 100(1-α)% confidence interval for $\boldsymbol{\theta}$.

15.(a) State the types of statistical hypothesis.

(OR)

(b) Explain the types of errors.

SECTION – C (5 X 5 = 25 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS. K4 & K5

16. (a) If X has the probability density

$$f(x) = \begin{cases} k.e^{-3x} & , x > 0 \\ 0, & otherwise \end{cases}$$

Find k and p(.5< X < 1)

(OR)

(b) Given the joint density $f(x) = \begin{cases} \frac{2}{3}(x+2y), 0 < x < 1, 0 < y < 1 \\ 0, \; otherwise \end{cases}$

Find the marginal densities of X and Y.

17. (a) A soft drink vending machines is set so that the amount of drink dispensed is a random variable with a mean of 200 milliliters and a standard deviation of 15 milliliters. What is the probability that the average amount dispensed in a random sample of size 36 is at least 204 milliliters?

(OR)

(b) Show that T = $\frac{(\bar{x} - \mu)}{s/\sqrt{n}}$ has t – distribution with (n-1) degrees of freedom.

18. (a) Show that $\bar{x}$is a minimum variance unbiased estimator of mean in normal population.

(OR)

(b) A random sample of size n from Gamma population with parameters α and β, find the moment estimators for the parameters α and β.

19. (a) If a random sample of size n = 20 from a normal population with variance 225 has the mean 64.3. construct a 95% confidence interval for the population mean μ.

(OR)

(b) In a random sample, 136 of 400 persons given a flu vaccine experienced some discomfort. Construct a 95% confidence interval for the proportion of persons who will experience some discomfort from the vaccine.

20. (a) Write the test procedure for testing the significant difference between sample mean and population mean in large sample.

(OR)

(b) The specifications for a certain kind of ribbon call for a mean breaking strength of 185 pounds. If five pieces randomly selected from different rolls have breaking strengths of 171.6, 191.8, 178.3, 184.9 and 189.1 pounds. Test the null hypothesis μ= 185 pounds against the null hypothesis μ< 185 pounds at 5% level.

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