MIZORAM PUBLIC SERVICE COMMISSION

GENERAL COMPETITIVE EXAMINATIONS FOR RECRUITMENT TO THE POST OF JUNIOR GRADE OF MIZORAM PLANNING, ECONOMICS & STATISTICAL SERVICE UNDER PLANNING & PROGRAMME IMPLEMENTATION DEPARTMENT.

JANUARY, 2020

STATISTICS PAPER-II

Time Allowed : 3 hours Full Marks : 100

*Attempt any **10 (ten)** questions taking **2 (two)** questions from each unit.*
All question carry 10 marks each.

UNIT-1

1. What is simple random sampling? A simple random sample of size 'n' is taken from a population of size 'N'. Show that the sample mean is an unbiased estimator of the population mean.

2. Define sampling distribution and standard error of a statistic. Suppose X has a normal distribution with mean μ and variance σ^2 find standard error of sample mean.

3. State criterion of good estimators. If random variable *X* follows the distribution *B(n,p)*, verify the unbiasedness of estimator *X[1-(X/n)]* for *p(1-p)*. If not, find an unbiased estimator.

UNIT-2

4. Define t distribution. Obtain the limiting form of t distribution with n degrees of freedom.

5. Define Snedecor's F distribution. State and prove reciprocal property of F distribution.

6. What do you mean by a χ^2 variate? Describe χ^2 test of goodness of fit.

UNIT-3

7. Explain the principal of testing of hypothesis. In a test of statistical hypothesis explain the terms Null hypothesis, Alternative hypothesis, Critical region, Size and Power.

8. In testing of hypothesis explain two types of errors. Given the frequency function

$$f(x)=\begin{cases}\frac{1}{\theta} & 0\le x\le\theta\\ 0 & otherwise\end{cases}$$

and that you are testing the null hypothesis $H_0:\theta=1$ against $H_0:\theta=2$ by means of single observed value of X. If you choose the interval $1\le x\le 1.5$ as the critical region. What will be probabilities of Type I and Type II errors?

9. State and prove Neymann-Pearson Lemma for testing of simple null verses simple alternative hypothesis.

UNIT-4

10. Outline the principle of statistical decision theory. Explain the terms viz. loss function, decision rule and minimax decision rule.

11. Write a short note on two persons zero sum game explaining the concepts about pure and mixed strategies. Also state Minimax theorem.

12. Reduce by dominance to 2x2 games and find the value and an optimal strategy of both the players for the game with matrix

$$\begin{pmatrix} 10 & 0 & 7 & 1 \\ 2 & 6 & 4 & 7 \\ 6 & 3 & 3 & 5 \end{pmatrix}$$

UNIT-5

13. What is a multiple linear regression model? Also state the basic assumptions in the model. Giving examples explain how to proceed for regression modeling in real life situations.

14. Obtain OLS estimator of parameters of a multiple linear regression model in a linear setup? Also give its properties.

15. What do you mean by BLUE? State and prove Gauss-Markov theorem in a multiple linear regression model.

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