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D5BEM2205 **Reg. No.....**

Name: .....

FIFTH SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2024

(Regular/Improvement/Supplementary)

ECONOMICS & MATHEMATICS (DOUBLE MAIN)

GDMT5B08T: STATISTICAL INFERENCE

Time: 2 ½ Hours **Maximum Marks: 80**

SECTION A: All questions can be answered. Each carries *two* marks.
(Ceiling 25 marks)

1. Distinguish between parameter and statistic.
2. Define population. Give an example.
3. What is sampling method?
4. Define cluster sampling.
5. State the sufficient set of conditions for the consistency of an estimator.
6. Comment on efficiency.
7. Define Fisher-Neymann factorization theorem.
8. Write any two properties of maximum likelihood estimator.
9. Define P value.
10. What is a power of a test?
11. Distinguish between one tailed and two tailed test.
12. Write down the test statistic for testing the equality of two population means when population standard deviations are known and unknown for a large sample.
13. Define sign test.
14. Elaborate on one-way ANOVA.
15. What is the use of Yate's correction?

SECTION B: All questions can be answered. Each carries *five* marks.

(Ceiling 35 Marks)

16. Explain Lottery method.
17. Describe systematic sampling.
18. If T_1 and T_2 are unbiased estimators of θ find λ such that $\lambda T_1 + (1 - \lambda)T_2$ has the least variance?
19. Show that the sample mean is sufficient for estimating the parameter λ in the Poisson distribution.

(PTO)

20. Write the steps involved in testing a statistical hypothesis.
21. Find the probability of type I error of the test which reject H0 if $X > 1 - \alpha$ in favour of H1, if X has pdf $f(x) = \theta x \theta - 1$, $0 < x < 1$ with H0 : $\theta = 1$ and H1 : $\theta = 2$. Find the power of the test.
22. Explain Mann - Whitney U test.
23. Describe χ^2 test for independence of attributes.

SECTION C: Answer any *two* questions. Each carries *ten* marks.

24. Define simple random sampling. Explain different methods for simple random sampling.

25. What do you mean by consistent estimator? Show that if t is a consistent estimator of θ, then t^2 is also a consistent estimator of θ^2.

26. a) Define probability of type I and type II errors.
    b) A box is known to contain either 3 red and 5 black balls or 5 red and 3 black balls. Three balls are to be drawn at random and it is conducted that the former is true if the number of red balls is less than 3 in the samples. Find the probabilities of type I and type II errors.

27. Four coins are tossed 80 times. The distribution of number of heads is given below:

No. of heads : 0	1	2	3	4	Total
Frequency : 4	20	32	18	6	80

Apply $\chi 2$ test if the coin is unbiased (Given $\alpha = 0.01$).

(2 × 10 = 20 Marks)