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0205N149

Candidate's Seat No :_____

MSc Sem.-2 Examination

408

Statistics

Time : 2-30 Hours] **May-2025** **[Max. Marks : 70**

Note: Attempt all questions.

Q.1

(i) Define Contagious distribution. Discuss applications of Contagious distributions. [7]

(ii) Define Poisson-Poisson distribution. Derive its probability mass function (pmf) using probability generating function(pgf). [7]

OR

(i) Show that Neyman type-A distribution tends to Normal distribution when $\lambda \to \infty$ and $m \to \infty$. [7]

(ii) Define Poisson-Binomial distribution. Obtain mean and variance of the distribution. [7]

Q.2

(i) Define non-central chi-square distribution. Obtain its moment generating function (mgf). [7]

(ii) Discuss cumulants of non-central chi-square distribution. [7]

OR

(i) Define non-central t distribution. State its properties. [7]

(ii) Define non-central 'F' distribution. Obtain its mean and variance. [7]

Q.3

(i) Define rth order statistic $X_{(r)}$. Obtain the joint p.d.f. of $X_{(r)}$ and $X_{(s)}$, $r < s$, in a random sample of size n from a population with continuous distribution function $P(.)$. Hence deduce the p.d.f. of sample range $W = X_{(n)} - X_{(1)}$. [7]

(ii) Show that for a random sample of size 2 from $N(0, \sigma^2)$ population, $E(X_{(1)}) = -\sigma/\sqrt{\pi}$. [7]

OR

(i) Let $X_1, X_2, \cdots, X_n$ be a random sample with common p.d.f. [7]

$$f(x) = \begin{cases} 1, & 0 < x < 1 \\ 0, & \text{otherwise} \end{cases}$$

(a) Find the p.d.f , mean and variance of $X_{(1)}$.

(b) Find the p.d.f. , mean and variance of $X_{(n)}$.

(c) Find Corr. $(X_{(1)}, X_{(n)})$.

(ii) Show that in odd samples of size n from $U[0, 1]$ population, the mean and variance of the distribution of median are $1/2$ and $1/[4(n+2)]$ respectively. [7]

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Q.4

(i) Discuss situations where Wilcoxon rank-sum test for two independent samples can be applied. [7]

(ii) Explain correlation between variate values and ranks with example. [7]

OR

(i) Explain Wilcoxon signed rank test for two dependent samples. [7]

(ii) What is a non-parametric test? Explain rank order statistics with appropriate example. [7]

Q.5 Answer any seven: [14]

(i) For Neyman type- A distribution mean is greater than variance.

(a)True (b) False

(ii) For Neyman type- A distribution β_1 =_____ .

(iii) State mean and variance of Poisson-Negative binomial distribution.

(iv) State additive or re-productive property of non-central chi-square distribution.

(v) Give one application of non-central t distribution.

(vi) Give one application of non-central F distribution.

(vii) What do you understand by distribution of range?

(viii) In usual notations, the c.d.f. of the largest order statistic $X_{(n)}$ is given by

(a) $F_n(x) = [F(x)]^n$ (b) $F_n(x) = [F(x)]^{n+1}$ (c) $F_n(x) = [1 - F(x)]^n$ (d) $F_n(x) = [1 + F(x)]^n$

(ix) Wilcoxon signed rank test is a parametric test.

(a)True (b) False

(x) In usual notations, the c.d.f. of the smallest order statistic $X_{(1)}$ is given by

(a) $F_1(x) = 1 - [1 - F(x)]^n$ (b) $F_1(x) = 1 + [1 - F(x)]^n$

(c) $F_1(x) = 1 - [1 - F(x)]^{n+1}$ (d) none of the above

(xi) Give a situation where you prefer sign test in place of Wilcoxon signed rank test.

(xii) Wilcoxon signed rank test is a non-parametric alternative to the one-sample _____test.

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