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D 122963 **(Pages : 2)** **Name.......................................**

Reg. No...................................

SECOND SEMESTER (CUFYUGP) DEGREE EXAMINATION, APRIL 2025

Statistics

STA 2MN 101—PROBABILITY THEORY—I

(2024 Admission onwards)

Time : Two Hours Maximum : 70 Marks

Section A

All questions can be answered.
Each question carries 3 marks.
Ceiling 24 marks.

1. If $f(x) = kx$, for $x = 1, 2, 3$ is a p.m.f., find k. Also find $P(X > 2)$.

2. If the p.d.f, $f(x) = 2x$, for $0 < x < 1$. find $P(0.2 < X\ 0.7)$.

3. Write any *three* properties of mathematical expectation of a random variable X.

4. Define r^{th} raw moment of a random variable X. If X is a random variable with values 1, 2, 3 and 4 with corresponding frequencies 0.2, 0.3, 0.3 and 0.2, find $E(X^3)$.

5. If X follow $B(10, 0.3)$, obtain $P(X > 1)$.

6. If $X \square U[-a, +a]$. Find a such that $P(X > 1) = 1/3$.

7. Define correlation analysis.

8. Define the regression lines X on Y and Y on X for two variables X and Y.

9. Define a statistic and its standard error.

10. Define sampling distribution. Give an example.

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603524

Section B

All questions can be answered.
Each question carries 6 marks.
Ceiling 36 marks.

11. Define distribution function of a random variable. If X is a continuous random variable with distribution function $F_x(x)$, explain the properties of $F_x(x)$.

12. Define the variance of a random variable X. For a constant a, prove that $V(X + a) = V(X)$.

13. Define exponential distribution. If X follow exponential distribution with parameter λ, find $E(X)$.

14. Define Chi-square distribution and obtain the mean and variance of X following Chi-square distribution with n degrees of freedom.

15. For two random variables X and Y, show that $\mathrm{Cov}(X + Y, X - Y) = V(X) - V(Y)$.

16. Define Pearson's co-efficient of correlation. Express Pearson's co-efficient of correlation in terms of expectations for two random variables X and Y.

17. Write a short note on curve linear regression.

18. Define (i) F-distribution ; and (ii) t-distribution.

Section C

Answer any **one** *question.*
The question carries 10 marks.

19. Define a Poisson distribution. Obtain its (i) Mean ; (ii) Variance ; and (iii) Moment generating function.

20. Define normal distribution. Obtain the mean and state and prove the additive property of normal distribution.

(1 × 10 = 10 marks)