Reg. No. : ....

Name : ....

K24U 3451

III Semester B.Sc. Degree (C.B.C.S.S. – O.B.E.– Regular/Supplementary/ Improvement) Examination, November 2024
(2019 to 2023 Admissions)
CORE COURSE IN STATISTICS
3B03STA : Probability Distributions and Limit Theorems

Time : 3 Hours Max. Marks : 48

PART – A
(Short Answer)

Answer **all** questions. **Each** question carries **one** mark.

1. Give the p.g.f. of a Poisson distribution.
2. When do you say that a random variable X is degenerate at c ?
3. Define cumulant generating function.
4. Give the points of inflexion of a normal curve.
5. Define a gamma distribution.
6. Give the characteristic function of an exponential distribution with mean $\frac{1}{\theta}$.

(6×1=6)

PART – B
(Short Essay)

Answer **any seven** questions. **Each** question carries **two** marks.

7. Let X be a binomial random variable with mean 6 and variance 2. Find the mode of X.
8. Find the moment generating function of a geometric distribution.

P.T.O.

9. If a random variable X ~ U (–2,3) then compute P (|X| ≤ 2).
10. Find the mode of a normal distribution.
11. Describe the additive property of an exponential distribution.
12. Obtain the mean and variance of a gamma distribution with parameter *p*.
13. Define convergence in probability.
14. Examine whether the WLLN holds for the sequence $\{X_n\}$ of independent random variables defined as $P\left\{X_n = \frac{1}{\sqrt{n}}\right\} = \frac{2}{3}$, $P\left\{X_n = -\frac{1}{\sqrt{n}}\right\} = \frac{1}{3}$
15. State Lindeberg- Levy form of Central Limit Theorem **(7×2=14)**

PART – C
(Essay)

Answer **any four** questions. **Each** question carries **four** marks.

16. Show that Poisson distribution is the limiting form of binomial distribution.
17. Derive the m.g.f. of a negative binomial distribution and hence find its mean and variance.
18. Let X ~ N (20,25). Evaluate P (X ≥ 23).
19. Let X be distributed as beta distribution of second kind with parameters p and q. Derive the distribution of $Y = \frac{1}{1+X}$. Identify the density function of Y.
20. State and prove Chebyshev's inequality.
21. A random variable X has E(X) = 3 and E (X^2) = 13. Obtain the lower bound of P(–2 < X < 8) .. **(4×4=16)**

PART – D
(Long Essay)

Answer **any two** questions. **Each** question carries **six** marks.

22. Let X and Y are two independent Poisson variates with parameters λ and μ respectively. Find the conditional distribution of X given X + Y.
23. For a normally distributed random variable X, 10.03% of the items are under 25 kg of weight and 89.97% of the items are under 70kg of weight. Find the mean and SD of X.
24. Find the mean and variance of a Beta distribution of Second kind with parameters *p* and *q*.
25. Let $\{X_n\}$ be a sequence of independent and identically distributed Poisson random variables with mean 2. Find P (120 ≤ S_n ≤ 180), where $S_n = X_1 + X_2 + \ldots + X_n$ and n = 75.

(2×6=12)
