17. State and prove Lapunov inequality.

18. State and prove Levy theorem.

19. Obtain mean and variance of Polya distribution.

20. Derive the Kolmogorov inequality.

S.No. 245 **12PMA13**

(For the candidates admitted from 2012–2013 onwards)

M.Sc. DEGREE EXAMINATION, NOVEMBER 2017.

Fourth Semester

Mathematics

PROBABILITY THEORY

Time : Three hours Maximum : 75 marks

SECTION A — ($10 \times 2 = 20$ marks)

Answer ALL questions.

1. Define distribution function.

2. Define impossible event.

3. State Tchebyshev inequality.

4. Define co-efficient of skewness.

5. Define semi-invariants.

6. Define probability generating function.

7. Define Polya distribution.

8. Define Uniform distribution.

9. State Borel-cantelli lemma.

10. State Levy-Cramer theorem.

SECTION B — (5 × 5 = 25 marks)

Answer ALL questions.

11. (a) If $\{A_n\} n = 1,2,3.....$ be a non-decreasing sequence of events and let A be their alternative then prove that $P(A) = \lim_{n \to \infty} P(A_n)$.

Or

(b) Obtain the distribution function for

$$f(x) = \begin{cases} 0 & \text{for} \quad x < 0 \\ \frac{x}{2} & \text{for} \quad 0 \le x \le 1. \\ 0 & \text{for} \quad x > 1 \end{cases}$$

12. (a) A random variable X is of the continuous type with the density function $f(x) = \frac{1}{\sqrt{2\pi}} e^{\frac{-x^2}{2}}$ then find the value of (i) $E(x)$ and $E(x^2)$

Or

(b) Prove that the coefficient correlation satisfies the inequality $-1 \le \rho \le 1$.

13. (a) Find the probability generating function of Binomial distribution.

Or

(b) (i) Show that $\phi(0) = 1$

(ii) Prove that $\phi(.\bar{t}) = -\phi(t)$

14. (a) Derive the Poisson distribution from the binomial distribution.

Or

(b) The random variable Y has the beta distribution with $p = q = 2$. Write its density function. What is the probability where Y is not greater than 0.2.

15. (a) State and prove Bernoulli's law of large number.

Or

(b) State and prove De-Moivre Laplace theorem.

SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Consider the random variable X with the density function $f(x) = \frac{1}{\sqrt{2\pi}} e^{\frac{-x^2}{2}}$ and Y with density function $f(y) = \frac{1}{\sqrt{2\pi}} e^{\frac{-y^2}{2}}$ then find the density function of $Z = X + Y$ where X and Y are independent.