



**LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034**

**M.Sc.DEGREE EXAMINATION –STATISTICS**

**SECOND SEMESTER – APRIL 2019**

**ST 2805– PROBABILITY THEORY**

Date: 13-04-2019  
Time: 09:00-12:00

Dept. No.

Max. : 100 Marks

**Section A**

**Answer ANY FOUR questions**

**(4 X 10 = 40)**

1. State and prove the continuity property of probability.
2. State and prove the necessary and sufficient condition for n random variables to be independent.
3. State and prove Basic inequality.
4. Show that convergence in probability implies convergence in distribution.
5. Define a Borel sigma field and show that any interval is a Borel set, but the converse is not true.
6. Define moment generating function and state and prove its properties.
7. State the inversion theorem for discrete and continuous case and find the distribution of  $\{u\} = e^{-|t|}$ ,  $-\infty < t < \infty$ .
8. State and prove the criterion for convergence in probability

**Section B**

**Answer ANY THREE questions**

**(3 X 20 = 60)**

9. State and prove weak law of large numbers for the non iid case.
10. State and prove Kolmogorov's strong law of large numbers.
11. State and prove the Lindeberg-Levi central limit theorem clearly explaining the assumptions.
12. Define the characteristic function of a random variable and state its properties, find the characteristic function of normal distribution
13. State and prove the necessary and sufficient condition for a function F to be the distribution function of a random variable.
14. State and prove (i) Minkowski Inequality and (ii) Jensen's Inequality.

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