

SECOND SEMESTER M.Sc. DEGREE EXAMINATION, APRIL 2025
(Regular/Improvement/Supplementary)

STATISTICS
FMST2C08- PROBABILITY THEORY

Time: 3 Hours**Maximum Weightage: 30****Part A: Answer any *four* questions. Each carries 2 weightage.**

1. Define limits of a sequence of random variables.
2. State Kolmogorov 0-1 law.
3. Show that distribution function of X is continuous iff $P(X=x) = 0$ for all x in R .
4. Define convergence in distribution function.
5. Show that characteristics function is non-negative definite.
6. Give an example of Martingale.
7. Briefly explain expectation for super martingale and sub martingale.

(4 × 2 = 8 weightage)

Part B: Answer any *four* questions. Each carries 3 weightage.

8. Discuss the necessary and sufficient condition for $F(x)$ to be the distribution function of a random variable x .
9. Explain Doob's decomposition.
10. State Bernoulli WLLN.
11. Show that convergence in r^{th} mean implies convergence in probability.
12. State and prove Helly Bray Lemma.
13. Discuss the invariance principle of characteristic function.
14. State and prove basic inequality.

(4 × 3 = 12 weightage)

Part C: Answer any *two* questions. Each carries 5 weightage.

15. State and prove Jordan Decomposition Theorem of distribution functions.
16. Show that a sequence of random variables converges a.s to a random variable iff the sequence converges mutually.
17. a) Discuss the association between Liapounov and Lindberg condition.
b) State and prove Liapounov CLT.
18. State and prove Radon-Nikodyne Theorem.

(2 × 5 = 10 weightage)