

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI 600 086
(For candidates admitted during the academic year 2009 – 10)

SUBJECT CODE: MT/PC/MS34

M. Sc. DEGREE EXAMINATION, NOVEMBER 2010
BRANCH I - MATHEMATICS
THIRD SEMESTER

COURSE : CORE
PAPER : MATHEMATICAL STATISTICS
TIME : 3 HOURS

MAX. MARKS : 100

SECTION – A (5 X 8 = 40)
ANSWER ANY FIVE QUESTIONS

1. Find the characteristic function of a Poisson random variable X and hence obtain its mean and variance.
2. Define Beta distribution and obtain its moments.
3. State and prove Chebyshev's Theorem.
4. Derive Chi-Square distribution. Find its mean and variance.
5. Define sample mean. Obtain the distribution of the Arithmetic Mean of independent normally distributed random variables.
6. Prove that \bar{X} is an unbiased estimate of mean m and s^2 is not unbiased estimate of variance σ^2 .
7. Explain the method of maximum likelihood.

SECTION – B (3 X 20 = 60)
ANSWER ANY THREE QUESTIONS

8. State and prove Levy's inversion theorem.
9. (i) Prove that a random variable will have one point distribution if and only if its variance is zero.
(ii) Obtain the characteristic function of random variable with Gamma distribution. Check the validity of addition theorem for gamma random variable.
10. (i) State and prove Lindeberg – Levy theorem.
(ii) State and prove Bernoulli's law of large numbers.
11. Derive students t-distribution. What is the condition for k^{th} order moment to exist?
12. Prove that an unbiased estimate U of the parameter Q is the most efficient if and only if (i) the estimate U is sufficient.
(ii) for $g(U, Q) > 0$, the density $g(U, Q)$ almost everywhere satisfies the relation

$$\frac{\partial \log g(U, Q)}{\partial Q} = c(U - Q).$$

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