STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI 600 086
(For candidates admitted from the academic year 2011–12& thereafter)

SUBJECT CODE : 11MT/MC/MS64

B. Sc. DEGREE EXAMINATION, APRIL 2015
BRANCH I – MATHEMATICS
SIXTH SEMESTER

COURSE : MAJOR CORE
PAPER : MATHEMATICAL STATISTICS
TIME : 3 HOURS **MAX. MARKS : 100**

SECTION-A

ANSWER ALL QUESTIONS: **10 X 2 = 20**

1. State the additive property of χ^2- variate.
2. Define F-distribution.
3. If a random variable has a binomial population with parameters n and p show that the sample proportion X/n is an unbiased estimator of p.
4. State Central Limit Theorem.
5. Define Estimator and Estimate.
6. State any two properties of M.L. Estimator.
7. Define level of significance.
8. If a statistic t is unbiased for θ, then show that t^2 is biased for θ^2.
9. Define Type I error and Type II error.
10. Define parameter and statistic.

SECTION-B

ANSWER ANY FIVE QUESTIONS: **5 X 8 = 40**

11. Find the moment generating function of χ^2 distribution.
12. Determine the even moments of t distribution
13. Find the moments of F-distriution.
14. State and prove Cramer-Rao inequality.
15. X_1, X_2, X_3 are independent random variable having Poisson distribution with parameter λ. Show that $(X_1 + X_2 + X_3)/3$ and $(5X_1 + 3X_2 + X_3)/9$ are also unbiased estimator of λ.
16. Find (1 - α) 100 % confidence interval for the mean of the normal population.
17. Show that in a 2 x 2 contingency table, wherein the frequencies are

Classes	A1	A2
B1	a	b
B2	c	d

Chi-square calculated from independent frequencies is

$$\frac{(a+b+c+d)(ad-bc)^2}{(a+b)(c+d)(b+d)(a+c)}$$

SECTION-C

ANSWER ANY TWOQUESTIONS: 2 X20 = 40

18. (a) Prove that the distribution of two independent χ^2variables is a beta distribution of second kind.
    (b) Obtain the estimators of μ and σ^2 by the method of moments.

19. (a) If $Xi\ , i = 1,2, \dots , n$ is a random sample from a population with density function $f\ (x, \alpha, \beta\ ) = \beta e^{-\beta(x-\alpha)}\ , \alpha < x < \infty$, find the ML estimator of α and β.
    (b) A simple random sample of size 100 has mean 15, the population variance being 25. Find an interval estimate of the population with a confidence interval of (i)95% and (ii) 99%

20. (a) Two sets of 10 students selected at random from a college were taken one set was given memory test as they were and the other was given the memory tests after two weeks of training and the scores are given below:

Set A	10	8	7	9	8	10	9	6	7	8
Set B	12	8	8	10	8	11	9	8	9	9

Do you think that there is any significant effect due to training?
(Given t = 2.10 at df =18, $\alpha = 0.05$)

(b) In two groups of ten children each the increases in weight due to two different diets in the same period were in pounds:
8 , 5 , 7 , 8 , 3 , 2 , 7 , 6 , 5 , 7 and 3 , 7 , 5 , 6 , 5 , 4, 4, 5, 3 , 6.
Find whether the variances are significantly different.