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 2017
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 random variable.
2. If T has a t – distribution with n degrees of freedom, Prove that T^2 has a F – distribution with $(1, n)$ degrees of freedom.
3. Define standard error of the sampling distribution and also give the standard error for sample mean and sample variance.
4. State Central Limit theorem.
5. List out the different types of estimators.
6. State any two properties of method of Maximum Likelihood estimators.
7. What do you mean by interval estimation?
8. Write the confidence interval for the mean of the normal population $N(\mu, \sigma^2)$.
9. A normal population has a mean of 6.48 and S.D. of 1.5. In a sample of 400 members, mean is 6.75. Is the difference significant?
10. State any two applications of χ^2 test.

SECTION-B

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

11. Show that $Z = \frac{\chi^2 - n}{\sqrt{2n}}$ is a standard normal variable.
12. Obtain a relation between F and χ^2 distribution.
13. Find the expectation and standard deviation of $\bar{X}$, where the random samples $(X_1, X_2, \ldots, X_n)$ are drawn from a population with mean μ and standard deviation σ.
14. Obtain the estimators of μ and σ^2 by the method of moments.
15. Find $100\ (1-\alpha)$ % confidence interval for the difference between the means when the variances of the two populations are unknown.
16. In a random sample of 50 pairs of values the correlation was found to be 0.89. Is this consistent with the assumption that the correlation in the population is 0.84?
17. A group of 10 rats fed on a diet A and another group of 8 rats fed on a different diet B, recorded the following increase in weights in grams. Test whether diet A is superior to diet B.

Diet A	5	6	8	1	12	4	3	9	6	10
Diet B	2	3	6	8	1	10	2	8	-	-

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SECTION-C

ANSWER ANY TWO QUESTIONS: 2 X20 = 40

18. Find the moment generating function and the first four central moments of χ^2 distribution. (20)

19. State and prove Cramer – Rao Inequality. (20)

20. a) A random sample of 100 students from MBA class made an average score of 60 with a standard deviation score of 15 in statistics. A random sample of 64 students from MSW class made an average score of 66 with a standard deviation of 16 in the same course. Construct a 95% confidence interval for the difference between the mean score of the two classes.

b) From the following data find whether there is any significant liking in the habit of taking soft drinks among the categories of employees using χ^2 test. (8+12)

Employees / Soft Drinks	Clerks	Teachers	Officers	Total
Pepsi	10	25	65	100
Thumps up	15	30	65	110
Bovanto	50	60	30	140
Total	75	115	160	350