STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI - 600 086
(For candidates admitted from the academic year 2019-20 & thereafter)

SUBJECT CODE : 19MT/AC/ST45

B. Sc. DEGREE EXAMINATION, APRIL 2022
BRANCH I – MATHEMATICS
FOURTH SEMESTER

COURSE : ALLIED CORE
PAPER : MATHEMATICAL STATISTICS – II
TIME : 3 HOURS **MAX. MARKS : 100**

SECTION – A

ANSWER ANY TEN QUESTIONS: **(10×2=20)**

1. Write two mathematical properties of Regression coefficients.
2. If r = 0.99, find the regression equation for the following data

	X	Y
Average	7.6	14.8
Standard deviation	3.6	2.5

3. What is called sampling? Give one example.
4. Write down two assumptions on t -test.
5. State any two characteristics of Chi-square test.
6. Write down 95% confidence limits for the true mean μ determined from large sample.
7. Define Fisher's F-test.
8. Mention any two applications of F-test.
9. What is called Linear trend in time series analysis?
10. Express additive model of time series analysis in terms of its components.
11. What is called ANOVA?
12. The trend of annual production of a company is described by $y_c = 18 + 0.6\,X$ with origin 2007;
    X-unit = 1 year ; Y unit = annual production. Convert the equation to a monthly trend equation.

SECTION – B

ANSWER ANY FIVE QUESTIONS: **(5×8=40)**

13. Find the mean of variables of X and Y and the correlation coefficient from the following regression equations: $2Y - X - 50 = 0$; $3Y - 2X - 10 = 0$. Estimate X when Y = 20.
14. A machine puts out 16 imperfect articles in a sample of 500. After the machine is overhauled, it puts out 3 imperfect articles in a batch of 100. Has the machine improved?
15. Productivity test of two food articles- Paddy and Wheat gives the following results:

	Average yield (tonnes)	S.D	No. of hectares
Paddy	80	10	120
Wheat	75	12	90

Is the difference between standard deviation significant?

16. Differentiate between point estimation and interval estimation. Obtain the 95% confidence limits for population parameter λ of the Poisson distribution $f(x,\lambda) = \frac{e^{-\lambda}\lambda^x}{x!}$.

(2+6)

17. In a sample of 8 observations, the sum of squared deviations of items from the mean was 94.5. In another sample of 10 observations, the value was found to be 101.7. Test whether the difference is significant at 5% level.
18. Explain briefly about four components of Time series analysis.
19. Assuming a four-yearly cycle, calculate the trend by the method of moving averages from the following data relating to the production of tea in India.

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Production (in million lbs)	464	515	518	467	502	540	557	571	586	612

SECTION – C

ANSWER ANY TWO QUESTIONS: (2×20=40)

20. a) Calculate the regression equations of X on Y and Y on X from the following data:

Sales	91	97	108	121	67	124	51	73	111	57
Purchases	71	75	69	97	70	91	39	61	80	47

b) The heights of six randomly chosen soldiers are in inches : 76, 70, 68, 69, 69 and 68. Those of 6 are randomly chosen sailors are 68, 64, 65, 69, 72 and 64. Discuss in the light of these data throw on the suggestions that soldiers are, on the average, taller than sailors, Use t-test.

(12+8)

21. a) From the data given below about the treatment of 250 patients suffering from a disease, state whether the new treatment is superior to the conventional treatment:

Type of treatment	No. of patients	
	Favourable	Not Favourable
New	140	30
Conventional	60	20

(Given at 5%, chi-square value is 3.84, for 1 d.f, and 7.81 for 3 d.f).

b) Fit a parabola of the second degree to the data given below:

Year	2003	2004	2005	2006	2007
Sales{'000)	16	18	19	20	24

(8+12)

22. Perform a two way analysis of variance on the data given below:

Plots of Land	A	B	C	D
I	50	40	48	39
II	46	48	50	45
III	39	44	40	39

(Use coding method subtracting 40 from the given numbers)