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

SUBJECT CODE : 19MT/AC/MP25

B. Sc. DEGREE EXAMINATION, APRIL 2023
BRANCH III – PHYSICS
SECOND SEMESTER

COURSE : ALLIED CORE
PAPER : MATHEMATICS FOR PHYSICS - II
TIME : 3 HOURS **MAX. MARKS : 100**

SECTION – A

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

1. Compute $\Gamma\left(\frac{1}{2}\right)$.
2. Prove that $\Gamma(n+1) = n!$.
3. Form the forward difference table for the following table:

x	1	2	3	4
$y(x)$	1	15	40	85

4. Write Trapezoidal rule.
5. Evaluate $\int_0^a \int_0^b (x^2+y^2)dxdy$.
6. Find $\int_0^1 \int_0^2 \int_0^3 (x+y+z)dxdydz$.
7. Find $L\left(Sin^2 2t\right)$.
8. Find $L\left(e^{-at}Cosbt\right)$.
9. Find $L^{-1}\left(\frac{1}{(s+a)^2}\right)$.
10. State any two properties of correlation coefficient.
11. Write the formula for Calculating Probable Error.
12. Write down any two merits of rank correlation.

SECTION-B

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

13. Express $\int_0^1 x^m(1-x^n)^p dx$ in terms of Gamma function and evaluate the integral

$\int_0^1 x^5(1-x^3)^{10} dx$.

14. Find the polynomial $y(x)$ using Newton's forward polynomial and evaluate y at $x = 5$.

x	4	6	8	10
y	1	3	8	10

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15. Change the order of integration and evaluate $\int_{O}^{4a}\int_{\frac{x^2}{4a}}^{2\sqrt{ax}} dydx$.

16. Evaluate $\iint xydxdy$ taken over the positive quadrant of the circle $x^2+y^2=a^2$.

17. Find $L^{-1}\left(\frac{s-3}{s^2+4s+13}\right)$.

18. Obtain the laplace transform for $f''(t)$.

19. Explain briefly about Scatter diagram.

SECTION-C

ANSWER ANY TWO QUESTIONS: **(2 × 20 = 40)**

20. a. Prove that $\beta(m,n)=\frac{\Gamma(m)\,\Gamma(n)}{\Gamma(m+n)}$ and deduce $\Gamma(n)\Gamma(1-n)$.

b. Evaluate $\int_{0}^{1}\frac{dx}{1+x^2}$ using Trapezoidal rule with h = 0.2 and hence determine the value of π.

21. a. Calculate coefficient of correlation from the following table.

X	12	9	8	10	11	13	7
Y	14	8	6	9	11	12	3

b. Solve $\frac{d^2y}{dx^2}+4\frac{dy}{dx}+13y=2e^{-x}$ given $y(0)=0, y'(0)=-1$.

22. a. Evaluate $\iiint xyzdxdydz$ taken through the positive octant of the sphere $x^2+y^2+z^2=a^2$.

b. A random sample of 5 college students are selected and their grades in Mathematics and Statistics are found to be;

Mathematics	85	60	73	40	90
Statistics	93	75	65	50	80

Calculate Pearman's rank correlation coefficient.

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