

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 2022
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:

(10x2=20)

1. Prove that $\beta(m, n) = \beta(n, m)$.
2. Compute the value of $\Gamma(1)$.
3. Form the backward difference table for the following data:

X	-1	0	1	2	3
$y(x)$	-21	6	15	12	3

4. Write Trapezoidal rule.
5. Evaluate $\int_0^{\pi/2} \int_0^{\pi/2} (a \sin 2\theta + b \cos 2\theta) d\theta d\phi$.
6. Compute $\int_0^a \int_0^b (x^2 + y^2) dx dy$.
7. Find the Laplace transform for $f(t) = \cos at$.
8. Find $L(e^{-at})$.
9. Find $L^{-1}\left(\frac{1}{(s+a)^2}\right)$.
10. State any two properties of correlation coefficient.
11. What is called multiple correlation?
12. Write down any two merits of rank correlation.

SECTION-B

ANSWER ANY FIVE QUESTIONS:

(5x8=40)

13. Show that $\int_0^{\pi/2} \sqrt{\sin \theta} d\theta \cdot \int_0^{\pi/2} \frac{1}{\sqrt{\sin \theta}} d\theta = \pi$.
14. Express $\int_0^1 x^m (1 - x^n)^p dx$ in terms of Gamma function and evaluate the integral $\int_0^1 x^5 (1 - x^3)^{10} dx$.
15. Find $y'(x)$ using Newton's forward interpolation formula for the following data:

X	0	1	2	3	4
$y(x)$	1	1	15	40	85

16. A curve passes through the points as given in the table. Find the area bounded by the curve, the x -axis, $x=1$ and $x=9$.

X	1	2	3	4	5	6	7	8	9
y(x)	0.2	0.7	1	1.3	1.5	1.7	1.9	2.1	2.3

17. Evaluate $\int_0^1 \int_{\sqrt{y}}^{2-y} x^2 dx dy$.

18. Find the inverse Laplace transform of $\frac{1}{(s+1)(s^2+2s+2)}$. Explain briefly about Scatter diagram.

19. Explain briefly about Scatter diagram.

SECTION-C

ANSWER ANY TWO QUESTIONS:

(2x20=40)

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

- b) Calculate the rank correlation coefficient for the following data:

X	48	33	40	9	16	16	65	24	16	57
Y	13	13	24	6	15	4	20	9	6	19

(10+10)

21. a) Find the value of $\iint xy dx dy$ taken over the positive quadrant of the ellipse

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

- b) Solve the equation $y'' + 4y' + 13y = 2e^{-x}$, given $y(0) = 0, y'(0) = -1$.

(8+12)

22. a) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Trapezoidal rule with $h = 0.2$. Hence determine the value of π .

- b) A person while calculating coefficient of correlation between two variables X and Y obtained the following results: $N = 30, \sum X = 120, \sum X^2 = 600,$
 $\sum Y = 90, \sum Y^2 = 250$ and $\sum XY = 356$. However, later discovered at the time of checking the calculations that two pairs of observations (8,10) and (12,7) were wrongly entered instead of (8,12) and (10,8). Determine the correct value of coefficient of correlation.

(10+10)
