

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 86
(For candidates admitted from the academic year 2025 – 2026 and thereafter)

B.Sc. DEGREE EXAMINATION, APRIL 2026
BRANCH I - MATHEMATICS
SECOND SEMESTER

COURSE : **CORE**
PAPER : **INTEGRAL CALCULUS**
SUBJECT CODE : **25MT/MC/IC24**
TIME : **3 HOURS** **MAX. MARKS: 100**

Q. No.	SECTION A (2 × 5 = 10) Answer ANY TWO questions	CO	KL
1.	Evaluate $\iint (x^2 + y^2) dx dy$, over a region where $x, y \geq 0, x + y \leq 1$	1	1
2.	Is the integral $\int_{-\infty}^0 e^x dx$ convergent?	1	1
3.	Evaluate $\int_0^{\pi/2} \sin^{10} \theta d\theta$ using Beta function.	1	1
Q. No.	SECTION B (2 × 5 = 10) Answer ANY TWO questions	CO	KL
4.	Find the value of $\Gamma\left(\frac{1}{2}\right)$	2	2
5.	Evaluate $\iint r^3 \sin^2 \theta dr d\theta$ over the area of the circle $r = a \cos \theta$	2	2
6.	Derive the formula for transformation from cartesian to spherical polar coordinates.	2	2
Q. No.	SECTION C (2 × 10 = 20) Answer ANY TWO questions	CO	KL
7.	Change the order of integration in the integral $\int_0^a \int_{x^2/a}^{2a-x} xy dx dy$ and evaluate.	3	3
8.	Evaluate: $P \int_{-1}^1 \frac{dx}{x}$	3	3
9.	Show that $\int_0^{\infty} x e^{-x^8} dx \cdot \int_0^{\infty} x^2 e^{-x^4} dx = \frac{\pi}{16\sqrt{2}}$	3	3
Q. No.	SECTION D (2 × 20 = 40) Answer ANY TWO questions	CO	KL
10.	By transforming into polar coordinates evaluate $\iint \frac{x^2 y^2}{x^2 + y^2} dx dy$ over the annular region between the circles $x^2 + y^2 = a^2$ and $x^2 + y^2 = b^2$ where $(b > a)$.	4	4
11.	Given that $x + y = u, y = uv$, change the variables to u, v in the integral $\iint [xy(1 - x - y)]^{1/2} dx dy$ taken over the area of the triangle with sides $x = 0, y = 0, x + y = 1$ and evaluate it.	4	4
12.	Establish the relations between Beta and Gamma functions.	4	4
Q. No.	SECTION E (2 × 10 = 20) Answer ANY TWO questions	CO	KL
13.	Change the order of integration and evaluate: $\int_0^a \int_y^a \frac{x^2}{\sqrt{x^2 + y^2}} dx dy$	5	5
14.	Find the area of the curvilinear quadrilateral bounded by the four parabolas $y^2 = ax, y^2 = bx, x^2 = cy, x^2 = dy$.	5	5
15.	Discuss the convergence of $\int_1^{\infty} \frac{x}{1+x^2} dx$	5	5

