| **SECOND SEMESTER (CUFYUGP) DEGREE EXAMINATION, APRIL 2025** |
| **MATHEMATICS** |
| **MAT2CJ101-INTEGRAL CALCULUS** |
| **2024 Admission Onwards** |

| **Maximum Time :2 Hours** | **Maximum Marks :70** |

Section A

All Question can be answered. Each Question carries 3 marks (Ceiling : 24 Marks)

1	Evaluate $\int \sin^2 x \, dx$
2	Find $\int \cos(7\theta + 5) \, d\theta$
3	Graph the integrand and use areas to evaluate the integral $\int_2^5 (2x + 1) \, dx$.
4	State Fundamental Theorem of Calculus
5	Find $\int \tan x \, dx$
6	Find y if $\ln y = t/2 + 7$
7	Find $\lim\limits_{x \to 0} \dfrac{x^2}{\sin x}$
8	Express $\dfrac{5x - 3}{x^2 - 2x - 3}$ as a sum of partial fractions.
9	Explain the method to find the area between two curves
10	Set up an integral for the length of the curve $y = x^2$; $-1 \le x \le 2$

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Section B

	All Question can be answered. Each Question carries 6 marks (Ceiling : 36 Marks))
11	Solve $\int \sqrt{4t-1}\, dt$
12	Suppose that f is continuous and that $\int_{1}^{2} f(x)dx = 4$. Show that $f(x) = 4$ at least once on $[1,2]$.
13	Evaluate the integral $\int_{0}^{\pi} \dfrac{\sec x \tan x}{2+\sec x}\, dx$
14	Solve the initial value problem $e^{y}\dfrac{dy}{dx} = 2x,\ x > \sqrt{3}, y(2) = 0$
15	Evaluate $\lim_{x \to 0}\left(\dfrac{1}{\sin x} - \dfrac{1}{x}\right)$
16	Evaluate $\int \dfrac{1}{\sqrt{4x-x^2}}\, dx$
17	Find the areas of the regions enclosed by the curves $x + y^2 = 3$ and $4x + y^2 = 0$
18	Find the volume of the solid generated by revolving the region bounded by $y = \sqrt{x}$ and the lines $y = 1, x = 4$ about the line $y = 1$.

Section C

	Answer any ONE. Each Question carries 10 marks (1x10=10 Marks))
19	Graph the function $f(x) = x^2 - 6x + 8$ on the interval $[0,3]$. Then find 1. find the area of the region between the graph and the x -axis. 2. average value of $f(x)$ over that interval
20	Find the length of the curve $x = \dfrac{y^3}{3} + \dfrac{1}{4y}$ from $y = 1$ to $y = 3$