K25FY4239 Pages: 2 Reg No:.....
Name:.....

First Semester FYUGP Degree (Reg/Sup) Examination
November 2025
KU1DSCMAT101 - CALCULUS I

2024 Admission onwards

Time : 2 hours Maximum Marks : 70

Section A

Answer any 6 questions. Each carry 3 marks.

1. Find simpler expressions for the following quantities : $2\ln(\sqrt{e})$.
2. Find the inverse of $y = x^2, x \geq 0$.
3. Compute $\int_{-\frac{\pi}{4}}^{0} \tan x \ \sec^2 x \ dx$.
4. Write the formula for arc length of a curve $y = f(x)$.
5. Using integration, find the area between x–axis and the curve $y = \cos x$ from $x = 0$ to $x = \pi$.
6. Find the derivative of $y = \dfrac{\cos x}{1 - \sin x}$.
7. Using quotient rule, find the derivative of $y = \dfrac{t^2 - 1}{t^3 + 1}$ w.r.t. t.
8. Find $\dfrac{d}{dx}(3^x)$.

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Section B

Answer any 4 questions. Each carry 6 marks.

9. Evaluate $\int_0^{\pi/4} \tan x \, dx$ using substitution.
10. Evaluate $\int_0^{\pi} \frac{\sin t}{2 - \cos t} \, dt$.
11. Show that the area of the region enclosed by the hyperbola $xy = 1$, x–axis and the two ordinates $x = 1, \ x = 2$ is $\log 2$.
12. Find an equation for a line that is tangent to the graph of $y = e^x$ and goes through the origin.
13. Find the slopes of the curve $3y^2 - 2x + 30 = 0$ at the points $(21, \ 2)$ and $(21, \ -2)$.
14. Given the equation $x^3 + xy - 2x = 1$. Find $\dfrac{dy}{dx}$ by differentiating implicitly.

Section C

Answer any 2 questions. Each carry 14 marks.

15. Use partial fractions to evaluate $\int \frac{1}{x(x^2+1)^2} dx$.

16. (a) Using partial fractions, evaluate $\int \frac{6x+7}{(x+2)^2}\, dx$.

    (b) Using trigonometric substitution, evaluate $\int \frac{dx}{\sqrt{16+x^2}}$.

17. (a) Find the inverse of the function $y = x^2,\ x \geq 0$, expressed as a function of x.

    (b) State Algebraic properties of the Natural Logarithm.

    (c) Simplify $3 \ln \sqrt[3]{t^2-1} - \ln(t+1)$.

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