Reg No:..... K24FY1340
Name :.....

First Semester FYUGP Mathematics Examination
NOVEMBER 2024 (2024 Admission onwards)
KU1DSCMAT101 (CALCULUS I)
(DATE OF EXAM : 2-12-2024)

Time : 120 min Maximum Marks : 70

Part A (Answer any 6 questions. Each carries 3 marks)

1. If $y = \sin u, u = 3x + 1$, find $\frac{dy}{dx}$. 3
2. State the Continuity test for real functions. 3
3. Evaluate $\int a^{2x}\, dx$. 3
4. Evaluate $\int x \cos x\, dx$. 3
5. Evaluate $\int_0^1 \frac{1}{x^2+1}\, dx$. 3
6. Compute $\int_{-\frac{\pi}{4}}^{0} \tan x \ \sec^2 x\ dx$. 3
7. Using integration, find the area between x–axis and the curve $y = \sin x$ from $x = 0$ to $x = \pi$. 3
8. Write the differential formula for arc length of a curve. 3

Part B (Answer any 4 questions. Each carries 6 marks)

9. Find the integral $\int x\sqrt{2x+1}\, dx$. 6
10. Compute $\int_0^{3/2} \frac{1}{\sqrt{9-x^2}}\, dx$. 6
11. Using trigonometric substitution, evaluate $\int \frac{x^2\, dx}{\sqrt{25-x^2}}$. 6
12. Evaluate $\int_{-\sqrt{7}}^{0} t(t^2+1)^{1/3}\, dt$. 6
13. Evaluate $\int_2^{16} \frac{dx}{2x\sqrt{\ln x}}$. 6
14. By integration find the area of the triangle whose sides are determined by the equations $y = x$, $y = 0$ and $x = 2$. 6

Part C (Answer any 2 question(s). Each carries 14 marks)

15. (a) Prove that $\cosh^2 x - \sinh^2 x = 1$.
    (b) Compute $\lim_{x\to 1} \frac{x^2+x-2}{x^2-x}$.

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16. (a) Estimate $\lim_{x\to 0} \frac{\sqrt{x^2+100}-10}{x^2}$

(b) If $\lim_{x\to -2} \frac{f(x)}{x^2} = 1$, find (i) $\lim_{x\to -2} f(x)$ (ii) $\lim_{x\to -2} \frac{f(x)}{x}$.

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17. (a) Prove the function $f(x) = |x|$ is continuous at every value of x.

(b) Find $\frac{dy}{dx}$ using the method of logarithmic differentiation, if $y = \pi^{\sin x}$.

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