D 50670 **(Pages : 3)** **Name.....**

Reg. No.....

FIFTH SEMESTER (CBCSS—UG) DEGREE EXAMINATION
NOVEMBER 2023

Mathematics

MTS 5D 01—APPLIED CALCULUS

(2020 Admission onwards)

Time : Two Hours Maximum : 60 Marks

Section A

Answer any number of questions.

Each question carries 2 *marks.*

Ceiling is 20.

1. If $f(x) = 3x^2 + 5x - 2$, find $f(0)$ and $f(-2)$.
2. Find the distance between the points P $(-2, 5)$ and Q $(4, -1)$.
3. Find $\lim_{x \to 1} \frac{\left(3x^3 - 8\right)}{x - 2}$.
4. If the position at time t of an object moving along a line is given by : $s(t) = t^3 - 6t^2 + 9t + 5$ at a time t, find it's velocity and acceleration.
5. Solve for x : $\log_{27} x = 3$.
6. Expand $\log_3 \left(x^3 y^{-4}\right)$.
7. Find $\int x^{12}\, dx$.
8. Find the equation of the line that passes through the point (5, 1) with slope $\frac{1}{2}$.
9. Evaluate $5^{\frac{1}{3}} \cdot 2^{\frac{1}{3}}$.
10. Find ln $\sqrt{e}$.

Turn over

11. Find x if $2^x = e^3$.

12. Find the second derivative of $y = x^2(3x + 1)$.

Section B

Answer any number of questions.

Each questions carries 5 *marks.*

Ceiling is 30.

13. Find $f\left(-\frac{1}{2}\right), f(1)$ and $f(2)$ if $f(x) = \begin{cases} \frac{1}{x-1}, & x < 1 \\ 3x^2 + 1, & x \geq 1 \end{cases}$.

14. Find the slope and y intercept of the line $3y + 2x = 6$ and draw the graph.

15. Find :

(a) $\lim_{x \to \infty} \frac{2x^2 + 3x + 1}{3x^2 - 5x + 2}$.

(b) $\lim_{x \to 1} \frac{\sqrt{x} - 1}{x - 1}$.

16. Find the derivative of $f(x) = x^3$, and then use it to find the slope of the tangent line to the curve $y - x^3$, at the point where $x = -1$. What is the equation of the tangent line at this point ?

17. Use chain rule to find $\frac{dy}{dx}$ where $y = \frac{u}{u+1}$ and $u = 3x^2 - 1$.

18. Find the intervals of increase and decrease for the function $f(x) = \frac{x^2}{x-2}$.

19. Find the absolute maximum and absolute minimum of the function

$f(x) = 2x^3 + 3x^2 - 12x - 7$.

Section C

Answer any **one** *question.*

The questions carries 10 *marks.*

20. For the curve $y = (2x + 1)(2x^2 - x - 1)$,

    (a) Find the derivative of y.

    (b) Find an equation for the tangent line to the curve at the point where $x = 1$.

    (c) Find all points on the curve where the tangent line is horizontal.

21. The highway department is planning to build a picnic park for motorists along a major highway. The park is to be rectangular with an area of 5,000 square yards and is to be fenced off on the three sides not adjacent to the highway. What is the least amount of fencing required for this job ? How long and wide should the park be for the fencing to be minimized ?

(1 × 10 = 10 marks)