Q.P Code:	D 112644	Total Pages 2	Name
			Register No.

FIRST SEMESTER UG DEGREE EXAMINATION, NOVEMBER 2024

(CUFYUGP)

MAT1MN101-CALCULUS

2024 Admissions

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

Section A

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

1	Define Instantaneous Rate of Change of a Function
2	Let $f(x) = x^2 + 2x + 1$. Find the point on the graph of f where the tangent line to the curve is horizontal.
3	Find the linearization $L(x)$ of the function $f(x) = x^3 - 2x^2$ at $a = 1$.
4	Find the absolute maximum and absolute minimum values, if any, of the function $y = x^2 + x$.
5	Find the relative maxima for the function $f(x) = 4x^2 - 4x$ in the interval $[-5, 5]$
6	Graph the function $y = 2x^2$ over the interval [- 2, 2].
7	Evaluate $\int (x^2 + 2)(x - 2)\, dx$
8	Find the average value of $f(x) = 2x^2$ on the interval $[2, 5]$
9	State the Mean Value Theorem for Integrals
10	Write a short note about Volume by Washer Method

Section B

All Question can be answered. Each Question carries 6 marks (Ceiling : 36 Marks))

11	Show that the Heaviside function $$H(x) = \begin{cases} 0 & \text{if } x \leq 0 \\ 1 & \text{if } x > 0 \end{cases}$$ which is discontinuous at 0, is not differentiable at 0
12	Find an equation of the tangent line to the bifolium $$4x^4 + 8x^2y^2 - 25x^2y + 4y^4 = 0$$ at the point (2, 1).
13	The side of a cube is measured with a maximum possible error of 2%. Use differentials to estimate the maximum percentage error in its computed volume.
14	Prove that the equation $x^7 + 6x^5 - 2x + 6 = 0$ has exactly one real root.
15	Find the function f given that the slope of the tangent line to the graph of f at any point $(x, f(x))$ is $x^2 - 2x + 3$ and the graph of f passes through the point $(1, 2)$.
16	Find $\int (x+1)\sqrt{2x-1}\, dx$
17	Find the value of c guaranteed by the Mean Value Theorem for Integrals for $f(x) = 2x^2 + 3$ on the interval [0, 2].
18	Find the area of the region bounded by the graphs of $y = 2 - x^2$ and $y = -x$

Section C

Answer any ONE. Each Question carries 10 marks (1x10=10 Marks))

19	By the Method of Cross Sections, find the volume of a right pyramid with a square base of side b and height h
20	Solve the initial value problem $f'(x) = x^3(x^2+1)^{1/2}$; $f(0) = 0$.