QP CODE: D1BMT2401

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

FIRST SEMESTER FYUGP EXAMINATION NOVEMBER 2024

MAJOR

MAT1CJ101 DIFFERENTIAL CALCULUS

Time : 2 Hrs BL : Bloom's Taxonomy Level (1 to 6) CO : Course Outcome **Maximum Marks : 70**

Section A — Ceiling Marks : 24

Answer all questions. Each carries 3 marks.

No.	Question	M	BL	CO
1.	Find the domain and range of $y = 1/x$.	3	2	CO1
2.	Show by an example that a function may fail to have a limit at a point in its domain.	3	6	CO1
3.	$Find \lim_{x\to 0^+} \frac{x}{\|x\|}$ $and \lim_{x\to 0^-} \frac{x}{\|x\|}$.	3	2	CO1
4.	Evaluate $\lim_{x\to 4} \frac{4x - x^2}{2 - \sqrt{x}}$	3	5	CO1
5.	At what points the function $y = \frac{x \tan x}{x^2 + 1}$ is continuous?	3	3	CO1
6.	State the Max-Min theorem for continuous functions.	3	1	CO2
7.	Define critical point of a function. Find the critical points of $f(x) = x^3 - 12x$ on [-3, 3].	3	3	CO2
8.	Write the second derivative test for concavity.	3	2	CO3
9.	Find $\lim_{x\to\infty} \left(5 + \frac{1}{x}\right)$ and $\lim_{x\to-\infty} \frac{1}{2+\frac{1}{x}}$.	3	3	CO3
10.	Evaluate $\lim_{x\to-\infty} \frac{-4x^3+7x}{2x^2-3x-10}$.	3	4	CO3

Section B — Ceiling Marks : 36

Answer all questions. Each carries 6 marks.

No.	Question	M	BL	CO
11.	Find the center and radius of the circle $x^2 + y^2 + 4x - 4y + 4 = 0$.	6	3	CO1
12.	Evaluate $\lim_{x\to 1^+} \frac{\sqrt{2x}(x-1)}{\|x-1\|}$ and $\lim_{x\to 1^-} \frac{\sqrt{2x}(x-1)}{\|x-1\|}$	6	5	CO1
13.	state and prove the sum rule for differentiation.	6	2	CO1
14.	Find the derivative of $y = \frac{(x-1)(x^2-2x)}{x^4}$.	6	3	CO1
15.	Find the absolute extrema values of $f(x) = \frac{2}{3}x - 5$ on [-2,3].	6	4	CO2
16.	State and prove the first derivative test for increasing and decreasing functions.	6	5	CO2
17.	Let $f'(x) = (x-1)^2(x+2)^2$. a) What are the critical points of f? b) On what intervals is f increasing or decreasing? c) At what points, if any, does f assume local extreme values?	6	6	CO2
18.	Using Sandwich theorem, find the asymptotes of the curve $y = 2 + \frac{sinx}{x}$.	6	5	CO3

Section C

Answer any one question. Each carries 10 marks. (1x10=10 marks)

No.	Question	M	BL	CO

19.	(a)If f has a derivative at $x = c$, then prove that f is continuous at $x = c$. (b) Show by an example that a function need not have a derivative at a point where it is continuous.	10	4	CO1
20.	Graph the function $y = x^3 - 3x + 3$.	10	6	CO3

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