International Islamic University Chittagong (IIUC)
Department of Electronic and Telecommunication Engineering
Midterm Examination

Program: **B.sc (Engg.)** Semester: **Autumn 2023**
Course Code: **Math-1107** Course Title: **Differential & Integral Calculus**
Total Marks: **30** Time: **1 Hour 30 Minutes**

(i) Answer all the questions. The figures in the right-hand margin indicate full marks.
(ii) Course Learning Outcomes (CLOs) and Bloom's Levels are mentioned in additional Columns.

Course Learning Outcomes (CLOs) of the Questions

CLO1 For complex Engineering problems, it is essential to get Knowledge of the limit, continuity, and differentiability, power series, Rolle's Theorem, Mean value theorem, Taylor, and Mclaurin's series. Also the need concept of the partial derivatives, and Integration.

CLO2 By using the above mentioned foundational mathematical information; One can implement it to solve the mathematical problems, which is expressing engineering principles.

Bloom's Levels of the Questions

Letter Symbols	R	U	Ap	An	E	C
Meaning	Remember	Understand	Apply	Analyze	Evaluate	Create

Q1	a)	Define differentiation with example. Apply the differentiation formula of the followings: i) $y = (4x^3 + 6x)^3 . \sin(x)$ ii) $y = e^{-3x} . \ln(2x^2 + 6x)$	CLO1	Ap	5
	b)	Examine the continuity of the function at x=5 $f(x) = \begin{cases} 3x + 5, & 0 < x < 5 \\ 5x - 5, & x \geq 5 \end{cases}$	CLO1	An	5
Q2	a)	Examine the validity of the Roll's theorem for the function, $f(x) = x^2 - 9x + 20$ on [4,5]	CLO1	E	5
	b)	If $y = \tan^{-1} x$, then apply the Leibnitz theorem and show that $(1 + x^2)y_{n+1} + 2nxy_n + n(n-1)y_{n-1} = 0$	CLO1	Ap	5
Q3	a)	Justify the Lagrange's Mean value theorem for the function, f(x) = $2x^2$ - 6x+1 on [3,4]	CLO1	E	5
	b)	If $\ln(y) = m \sin^{-1} x$ then apply the Leibnitz theorem and show that $(1 - x^2)y_{n+2} - (2n + 1)xy_{n+1} - (n^2 + m^2)y_n = 0$	CLO1	Ap	5
		OR			
Q4	a)	Examine the continuity of the function at x=0 and x=$\frac{3}{2}$ $f(x) = \begin{cases} 3 + 2x, & when \quad -\frac{3}{2} \leq x < 0 \\ 3 - 2x, & when \quad 0 \leq x < \frac{3}{2} \\ -3 - 2x, & when \quad x \geq \frac{3}{2} \end{cases}$	CLO1	An	5
	b)	Expand the function f(x)=Sin(x), in terms of McLaurin's series.	CLO1	U,R	5