International Islamic University Chittagong (IIUC)

Department of Electronic and Telecommunication Engineering

Midterm Examination

Program: **B.sc (Engg.)** Semester: **Spring 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)	Discuss the Application of Differential Calculus in Electronic and Telecommunication Engineering field.	CLO1	R	2
	b)	Apply the differentiation formula of the followings: . i) $y = (5x^3 + 10x)^4.\ \mathrm{Sin}(3x)$ ii) $y = e^{-2x}.\ \ln(3x^3 + 5x)$	CLO2	Ap	4
	c)	Apply the L'Hospital Rule for the following: $\lim_{\theta\to 0} \frac{e^{\theta} - e^{\sin\theta}}{\theta - \sin\theta}$	CLO2	Ap	4
Q2.	a)	Expand the function f(x)=Sin(3x), in terms of McLaurin's series.	CLO1	U	3
	b)	Examine the continuity of the function at x=4 $f(x) = \begin{cases} 4x + 5, & 0 < x < 4 \\ 5x + 1, & 0 \geq x \geq 4 \end{cases}$	CLO2	E	3
	c)	Evaluate the Differentiability of the function $f(x) = x^2 + 3x - 2\ at\ x = 1$	CLO2	E	4
Q3.	a)	Examine the validity of the Roll's theorem for the function, $f(x) = x^2 - 8x + 12$ on [2,6]	CLO2	E	5
	b)	If $y = \sin(m \sin^{-1} x)$, then apply the Leibnitz theorem and show that $(1 - x^2)y_{n+2} - (2n + 1)xy_{n+1} + (m^2 - n^2)y_n = 0$	CLO2	Ap	5
		OR			
Q3.	a)	Justify the Lagrange's Mean value theorem for the function, $f(x) = 4x^2-3x+5$ on [3,4]	CLO2	C	5
	b)	If $\ln(y) = m \sin^{-1} x$ then apply the Leibnitz theorem and show that $(1 - x^2)y_{n+2} - (2n + 1)xy_{n+1} - (n^2 + m^2)y_n = 0$	CLO2	Ap	5