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

Program: **B.sc (Engg.)**
Course Code: **Math-1107**
Total Marks: **50**

Semester: **Autumn 2022**
Course Title: **Differential & Integral Calculus**
Time: **2 Hours 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

Part A
Answer <u>Two</u> of the following Questions

Q1	a)	Define critical point and saddle point of a function with example. Is the function f(x)= $2x^2$ -16x+10 having maximum or minimum value?	CLO2	R, U	5
	b)	Solve Analyse the function $f(x,y)=2x^2+3y^2+20x-42y+50$ and find the critical points and classify them as minima, maxima, or saddle points	CLO2	An	5
Q2	a)	If u= $3x^3+4x^2y^2-2z^2+20$, then evaluate the followings: $\frac{\partial^2 u}{\partial x^2}, \frac{\partial^2 u}{\partial y^2}, \frac{\partial^2 u}{\partial z^2}$	CLO2	R, U	5
	b)	Define homogeneous function with examples. Apply Euler's theorem and show that, u(x,y)= $4x^3+5x^2y+6y^3$ is equation of 3rd degree.	CLO2	Ap	5

OR

Q2	a)	If $\tan^{-1}\left(\frac{x^3+y^3}{x+y}\right)$ then show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \sin 2u$	CLO2	U	5
	b)	If $v = \left(x^2 + y^2 + z^2\right)^{\frac{-1}{2}}$ then show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z} = -v$	CLO2	U	5

Part B
Answer <u>Three</u> of the following Questions

Q3	a)	Define integration with example. Solve the followings: i) $\int ln(x)\, dx$ ii) $\int tan^{-1}x\, dx$	CLO2	R, U	5
	b)	What is the difference between definite and indefinite integral? Solve the following definite Integral: $\int_2^3 e^{x^2+3x-2} (2x+3)\, dx$	CLO2	R, U	5
Q4	a)	Define multiple integral with example. Evaluate the following double integral: $\int_2^3 \int_3^6 (xy)\, dxdy$	CLO2	R, E	5
	b)	Apply the integral formula for calculate the circumference of the circle, $x^2 + y^2 = 4^2$ about the y-axis.	CLO2	Ap	5
Q5	a)	Analysis the volume generated by the areas bounded by the curve $x = y^3$ from $x = 0$ to $x = 3$ about the x-axis.	CLO2	An	5
	b)	Evaluate the triple integral, $I = \int_1^3 \int_0^3 \int_0^4 (2xyz\, dz\, dy\, dx$	CLO2	E	5

OR

Q5	a)	Define Gamma function. Apply the gamma function of the following: $\int_0^\infty x^3 e^{-\sqrt{x}}\, dx$	CLO2	Ap	5
	b)	Create the value of the following: $\int_0^{\pi/2} sin^3\theta\, cos^3\theta d\theta$	CLO2	C	5