INTERNATIONAL ISLAMIC UNIVERSITY CHITTAGONG
Department of Electronic & Telecommunication Engineering
B. Sc. In ETE, Final Examination, **Spring 2022**
Course Code: **Math-1107**   Course Title: **Differential & Integral Calculus**

Time: **2.5 hours**   Marks: **50**

(Answer any two from Group-A & any three from Group-B. Separate answer script must be used for separate group. Figures in the right margin indicates full marks)

Group A (Answer any 02)

1.	a)	Discuss critical point and saddle point.	
		Calculate the maximum and minimum values of the following functions: i) $f(x)= 6x^3-4x^2+5x+10$ ii) $f(x)= 4x^3-15x^2+12x-30$	5 CO1 & CO2
	b)	For the function $f(x,y) = 4x^2 + 9y^2 + 8x - 36y + 24$, find the critical points and classify them as minima, maxima, or saddle points.	5 CO1 & CO2
2.	a)	Discuss Partial Derivatives. If $U= 2x^5-3x^2y^3+7y^5z^3+3z^3+20$, evaluate the followings: $\frac{\delta^2 u}{\delta x^2}, \frac{\delta^2 u}{\delta y^2}, \frac{\delta^2 u}{\delta z^2}$	5 CO1 & CO2
	b)	If $Z = x^2 tan^{-1}\left(\frac{y}{x}\right) - y^2 tan^{-1}\left(\frac{x}{y}\right)$ show that $\frac{\partial^2 z}{\partial y\, \partial x} = \frac{x^2-y^2}{x^2+y^2}$	5 CO2
3.	a)	Discuss homogenous function with example. State and prove Euler's theorem on homogeneous function.	4 CO1
	b)	Show that, $u(x,y)= 2x^3+5xy^2+4y^3$ is equation of 3rd degree by using Euler's theorem on homogeneous function.	3 CO1
	c)	If $U = e^{xyz}$, then show that $\frac{\partial^3 u}{\partial x\, \partial y\, \partial z} = e^{xyz}(1 + 3xyz + x^2 y^2 z^2)$	3 CO1

Group-B (Answer any 03)

4.	a)	Discuss Integration with examples. Discuss different types of integral.	2.5 CO1
	b)	Evaluate the following Integrals: (i) $\int ln(x)\, dx$ (ii) $\int tan^{-1}x\, dx$ (iii) (iii) $\int x^2 sinx\, dx$	7.5 CO2
5.	a)	Discuss Multiple Integral. Evaluate the double integral $I=\int_2^4 \int_{x^2}^{x^2+1} xy\, dxdy$	5 CO2
	b)	Evaluate the triple integral, $I = \int_1^3 \int_2^4 \int_0^2 (2xyz + 3y^2 z + 5)\, dz\, dy\, dx$	5 CO2

6.	a)	Discuss Gamma function and Beta function with examples	2 CO1
	b)	Evaluate the followings:	4x2=8 CO2
		i) $\int_0^\infty x^5 e^{-6x}\, dx$ \qquad ii) $\int_0^2 x^4 (8-x^3)^{-1/3}\, dx$	
7.	a)	Evaluate the followings:	3x2=6 CO2
		(i) $\int_3^5 x e^x dx$ \qquad ii) $\int_1^3 e^{2x^3+4x-10} (6x^2+4)\, dx$	
	b)	Evaluate $\int_0^{\pi/2} \sin^7\theta \cos^9\theta\, d\theta$	4 CO2