

INTERNATIONAL ISLAMIC UNIVERSITY CHITTAGONG	
Department of Computer & Communication Engineering	
B. Sc. in CCE, Final Examination, Spring 2022	
Course Code: Math-1107 Course Title: Differential & Integral Calculus	
Time: 2.5 hours	Marks: 50
<i>(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)</i>	
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 3 rd degree by using Euler's theorem on homogeneous function.	3 CO1
□	□		□
□	c)	If $U = e^{xyz}$, then show that $\frac{\partial^3 u}{\partial x \partial y \partial z} = e^{xyz}(1 + 3xyz + x^2y^2z^2)$	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) $\int x^2 \sin x dx$	7.5 CO2
5.	a)	Discuss Multiple Integral. Evaluate the double integral $I = \int_2^4 \int_{x^2}^{x^2+1} xy dx dy$	5 CO2
□	□		□
□	b)	Evaluate the triple integral, $I = \int_1^3 \int_2^4 \int_0^2 (2xyz + 3y^2z + 5) dz dy dx$	5 CO2
□	□		□

6.	a)	Discuss Gamma function and Beta function with examples	2 CO1
	b)	Evaluate the followings:	
		i) $\int_0^{\infty} x^5 e^{-6x} dx$ ii) $\int_0^2 x^4 (8 - x^3)^{-1/3} dx$	4x2=8 CO2
7.	a)	Evaluate the followings:	3x2=6 CO2
		(i) $\int_3^5 xe^x dx$ 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