

International Islamic University Chittagong
Department of Economics & Banking

Semester End Examination, Autumn-2023

Course Code: MATH-1101

Time: 2 hours 30 minutes

Program: BSS (Hons) in Economics & Banking

Course Title: Fundamentals of Mathematical Economics

Full Marks: 50

[Answer the following questions. All parts of a question must be answered sequentially. Figures in the right margin indicate full marks.]

QN	Description of Questions	Marks	CLOs & PLOs	Cognitive learning
1.	a) Consider the following national income model : $Y = C + I_0 + G_0$ $C = 50 + 0.8(Y - T)$ $T = 10 + 0.2Y$ $I_0 = 70$ $G_0 = 200$	1 4	CLO-4 & PLO-3	Remembering Applying
	i) How many endogenous variables and exogenous variables are there?			
	ii) Find the equilibrium value of Y, C and T.			
	b) Consider the following market model: $Q_{d1} = 18 - 3P_1 + P_2$ $Q_{s1} = -2 + 4P_1$ $Q_{d2} = 12 + P_1 - 2P_2$ $Q_{s2} = -2 + 3P_2$		CLO-4 & PLO-3	Remembering Applying
	i) Is it a complete model? Explain the reasons.	1		
	ii) Compute the equilibrium prices and quantities.	4		
2(a)	Given the function: $Y = 5x^2 - 4x$			
	i) Find the difference quotient as a function of x and Δx .	3	CLO-5 & PLO-4	Analyzing
	ii) Illustrate the derivative dy/dx .	1		
	iii) Find $f'(2)$ and $f'(6)$.	2		
2(b).	Use the chain rule to find dy/dx for the following functions:	4		Applying
	i) $y = (3x^2 - 13)^3$			
	ii) $y = u^3 + 2u$ and $u = 5 - x^2$			
3.	Differentiate the following functions:	10	CLO-5 & PLO-4	Evaluating
	i) $y = (9x^2 - 2)(3x + 1)$			
	ii) $C = 3q^2 + 7q + 12$			
	iii) $y = \ln t^5 + 7^t$			
	iv) $z = \frac{6x}{x+5}$			
	v) $y = x^2 e^{2x}$			

Or

Determine f_1 and f_2 from the following functions: 10

i) $f(x_1, x_2) = (2x_1 + 3)(x_2 - 2)$

ii) $f(x_1, x_2) = \frac{x_1^2 - 1}{x_1 x_2}$

iii) $f(x_1, x_2) = 7x_1 + 6x_1 x_2^2 - 9x_2^3$

Evaluating

4 a) Given the production function $Q = 96K^{0.3}L^{0.7}$, 4
determine the MPP_K and MPP_L functions.

b) If the utility function of an individual takes the form

$$U = (x_1 + 2)^2(x_2 + 3)^2$$

where U is total utility, and x_1 and x_2 are the quantities of two commodities consumed.

i) Determine the marginal utility function of each of the two commodities. 4

ii) Determine the value of marginal utility of the first commodity when 3 units of each commodity are consumed. 2

CLO-5
&
PLO-4

Or

4(a). Use the rules of differentials to find 5
the total differential from the following functions:

i) $y = \frac{z_1}{z_1 + z_2}$

ii) $y = 3x_1(2x_2 - 1)(x_3 + 5)$

4(b). Find the total derivatives: 5

i) $z = 5x + xy - y^2$, where $x = 3y^2$

ii) $z = f(x, y, t)$, where $x = a + bt$ and $y = c + kt$

5(a) Given the demand function: 6

$$Q = 100 - 2P + 0.2Y$$

i) Illustrate the price and income elasticity of demand assuming $P=20$, and $Y=5000$.

ii) Make comment on your results.

CLO-1
&
PLO-2

Analyzing

b) The supply function of a certain commodity is 4

$$Q = a + bp^2 + R^{\frac{1}{2}} \quad (a < 0, b > 0) [R = \text{Rainfall}]$$

Find the price and rainfall elasticity of supply.