



**UNIVERSITY OF NORTH BENGAL**  
B.Com. Honours 4th Semester Examination, 2022

**CC9-COMMERCE**  
**BUSINESS MATHEMATICS**

Time Allotted: 2 Hours

Full Marks: 60

*The figures in the margin indicate full marks.  
All symbols are of usual significance.*

**GROUP-A**

Answer any *two* questions

12×2 = 24

1. (a) Solve using Cramer's rule:

8+4

$$2x - y + 2z = -8$$

$$x + 2y - 3z = 9$$

$$3x - y - 4z = 3$$

- (b) If  $y = f(x) = \frac{ax+b}{cx-a}$ , prove that  $f(y) = x$ .

2. (a) Find  $\frac{dy}{dx}$  if  $x^y = y^x$ .

6+6

- (b) If  $y = \frac{x}{1-x^2}$ , then find the value of  $\frac{d^2y}{dx^2}$  at  $x = 2$ .

3. (a) A sinking fund is created for redemption of debenture of Rs. 1,00,000/- at the end of 5 years. How much money should be provided out of profit each year for the sinking fund if the instrument can earn interest @ 4% P.A. at compound rate?

8+4

- (b)  $\lim_{x \rightarrow 1} \frac{\log x}{x-1} = 1$ , prove it.

4. (a) Find the value of  $\int_1^2 e^x x^2 dx$ .

6+6

- (b) Verify Euler's theorem for the function,  $f(x, y) = \frac{x^3 + y^3}{x - y}$ .

5. Solve by application of the Simplex method:

12

$$\begin{aligned} \text{Maximize, } & Z = 2x_1 + 3x_2 \\ \text{Subject to, } & 7x_1 + 4x_2 \leq 28 \\ & 7x_1 + 12x_2 \leq 52 \\ & x_1 \geq 0, x_2 \geq 0 \end{aligned}$$

**GROUP-B**

6. Answer any **four** questions:

6×4 = 24

(a) In what time would a sum of money triples itself @ 8% C. I. p.a.

[Given  $\log 1.08 = 0.03342$ ] and [ $\log 3 = 0.4771$ ]

(b) Solve:  $\lim_{x \rightarrow \infty} \frac{4x^3 - 3x^2 + 6x - 2}{3 + 5x^2 - 5x^3}$

(c) Is the function  $f(x)$  continuous at  $x = 1$  if,

$$\begin{aligned} f(x) &= x + 1 \quad \text{for } x \leq 1 \\ &= 3 - 2x^2 \quad \text{for } x > 1 \end{aligned}$$

(d) Find  $\frac{dy}{dx}$ , if  $x^y = e^{x-y}$ .

(e) Integrate:  $\int \frac{x^3 dx}{x^2 + 7x + 12}$

(f) Find the inverse of the matrix:

$$\begin{bmatrix} 2 & 3 \\ -1 & 4 \end{bmatrix}$$

**GROUP-C**

7. Answer any **four** questions:

3×4 = 12

(a) Find  $\frac{dy}{dx}$  of the function  $f(x) = \frac{1}{2x}$  by application of 1<sup>st</sup> principle.

(b) Evaluate:  $\int \frac{e^{-x}}{1 + e^{-x}} dx$

(c) Show that the function  $x^3 - 3x^2 + 3x + 1$  is neither a maximum nor a minimum at  $x = 1$ .

(d) If  $f(x) = x$  for  $0 < x \leq 1$   
 $= -x$  for  $-1 < x < 0$   
 $= 0$  for  $x = 0$ , examine the continuity of  $f(x)$  at  $x = 1$ .

(e) Find  $\frac{dy}{dx}$  when  $3x^2 + 2xy + 3y^2 = 0$ .

(f) What is a null matrix? What is a unit matrix?

$1\frac{1}{2} + 1\frac{1}{2}$

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