'समानो मन्त्रः समितिः समानी'

# UNIVERSITY OF NORTH BENGAL

B.Com. Honours 3rd Semester Examination, 2023

## CC5-COMMERCE

## BUSINESS MATHEMATICS

## REVISED NEW SYLLABUS

Time Allotted: 2 Hours | Full Marks: 60

*The figures in the margin indicate full marks.*

### GROUP-A

**Answer any *two* questions** 12×2 = 24

1. (a) Solve the following system of linear equations by using Cramer's rule: 6

$$\frac{3}{x}+\frac{1}{y}+\frac{1}{z}=4,\ \frac{1}{x}+\frac{2}{y}-\frac{1}{z}=-3,\ \frac{1}{x}-\frac{1}{y}+\frac{2}{z}=6.$$

(b) Find the value of $x, y, z$ if the matrix 6

$$A=\begin{pmatrix}0 & 2y & z\\ x & y & -z\\ x & -y & z\end{pmatrix}$$ obeys the law $A^T\cdot A=I$.

2. (a) If $f(x)=\dfrac{ax-b}{bx-a}$ show that $f(a)\cdot f\left(\dfrac{1}{a}\right)-f(b)\cdot f\left(\dfrac{1}{b}\right)=0$. 6

(b) Find $\dfrac{dy}{dx}$ when $x^m\cdot y^n=(x+y)^{m+n}$. 6

3. (a) A function $f(x)$ is defined as follows: 4

$$f(x)=x+1, \quad \text{when } x\le 1,$$
$$=3-ax^2, \quad \text{when } x>1$$

For what value of '$a$' will $f(x)$ be continuous at $x=1$?

(b) Find $\dfrac{dy}{dx}$ when $y=\dfrac{4^x}{\log x}$. 4

(c) Evaluate: 4

$$\lim_{x\to 0}\frac{\sqrt{1+2x}-\sqrt{1-3x}}{x}.$$

4. (a) Evaluate: 6

$$\int \frac{e^x}{x}(1 + x\log x)\,dx, \text{ when } x > 0$$

(b) A wagon is purchased on instalment basis, such that Rs. 5,000 is to be paid on the signing of the contract and four yearly instalment of Rs. 3,000 each payable at the end of the first, second, third and fourth years. If interest is charged at 5% p.a., what would be the cash down price? 6

## GROUP-B

5. Answer any ***four*** questions from the following: 6×4 = 24

(a) Verify the Euler's theorem for the function $f(x, y) = \frac{x^3 + y^3}{x - y}$. 6

(b) Find $\frac{dy}{dx}$ if $x = \frac{2at}{1 + t^2}$, $y = \frac{1 - t^2}{1 + t^2}$. 6

(c) If the total cost function is $C = 3x^3 - 4x^2 + 2x$, find at what level of output, average cost be minimum and what level will it be? 6

(d) A sum of money invested at C.I. payable yearly amounts to Rs. 10,816 at the end of the second year and to Rs. 11,248.64 at the end of the third year. Find the rate of interest and the sum. 3+3

(e) Show that: 6

$$\int_a^b \frac{\log x}{x}\,dx = \frac{1}{2}\log(ab)\log\left(\frac{b}{a}\right).$$

(f) Find $\frac{d^2y}{dx^2}$, when $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$. 6

## GROUP-C

6. Answer any ***four*** questions from the following: 3×4 = 12

(a) What is Transpose of a matrix? Give an example. 3

(b) Show that: 3

$$\lim_{x \to \infty} \frac{4x^3 + 5x - 1}{6x^3 + 7x^2 + 4} = \frac{2}{3}.$$

(c) Evaluate: $\int xe^x\,dx$. 3

(d) What principal will amount of Rs. 720.325 in 4 years at 3% per annum compound interest? 3

(e) If the total revenue function is : $TR = 3x^3 - 3x^2 + 656x$, determine the marginal revenue function. 3

(f) If $A = \begin{pmatrix} 9 & 1 \\ 1 & 3 \end{pmatrix}$, $B = \begin{pmatrix} 1 & 5 \\ 7 & 12 \end{pmatrix}$, find the matrix $X$, such that $5A + 3B + 2X = 0$. 3

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