'समानो मन्त्रः समितिः समानी'

UNIVERSITY OF NORTH BENGAL

BBA Honours 2nd Semester Examination, 2022

CC3-BBA (202)

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 from the following 12×2 = 24

1. (a) Find the maximum and minimum values of the following function: 5

$$f(x) = x^3 + x^2 - 4x + 6$$

(b) A manufacturer can sell "x" items per month at a price $p = 300 - 2x$. Produced items cost the manufacturer "y" rupees where $y = 2x + 1000$. How much production will yield maximum profits and what will be the price? 7

2. Integrate the following: 6+6 = 12

(i) $\int x^2\sqrt{1+x^3}\ dx$ (ii) $\int \frac{e^{5x} + e^{3x}}{e^{4x}}\ dx$.

3. (a) If $x^m * y^n = (x+y)^{m+n}$, then show that $\frac{dy}{dx} = \frac{y}{x}$. 6

(b) If $y = \left[x + \sqrt{x^2 - 1}\right]^m$ then show that $(x^2-1)y_2 + xy_1 = m^2 y$. 6

4. (a) If the present value of an annuity for 10 years at 6% p.a. compound interest is Rs. 15,000, what is the annuity? 4

(b) Solve the following equations using matrix inversion method: 8

$$4x + 2y + 3z = 49$$

$$3x + 3y + 2z = 45$$

$$4x + 3y + 4z = 58$$

GROUP-B

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

(a) Total cost function of a firm is given as below

$$C = 1200 + 200Q - 9Q^2 + 0.25Q^3$$

C denotes total cost and Q stands for level of output. You are required to find the optimum level of output.

(b) If $y = \log\left(x + \sqrt{x^2 + a^2}\right)$, show that $\frac{dy}{dx} = \frac{1}{\sqrt{x^2 + a^2}}$.

(c) Solve using Cramer's Rule

$$x + y - z = 1$$
$$4x - 2y - z = 1$$
$$3x + 2y + z = 6$$

(d) Given $A = \begin{bmatrix} 3 & 1 \\ 0 & 2 \end{bmatrix}$ show that $A^3 + A^2 - 24A + 36I = 0$

Where I is the identity matrix.

(e) Given, $3x^4 + 4y^3$ find $\frac{dy}{dx}$.

(f) The difference between compound interest and simple interest on a certain sum of money for 3 years at 5% p.a. is Rs. 228.75. If the sum is invested at 5% compound interest, what will be the amount at the end of 2 years?

GROUP-C

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

(a) Integrate: $\int x\, dx$ using integration by parts.

(b) Given $A = \begin{vmatrix} 4 & 1 & 0 \\ 1 & -2 & 2 \end{vmatrix}$ and $B = \begin{vmatrix} 2 & 0 & -1 \\ 3 & 1 & 4 \end{vmatrix}$ find the value of x such that $3B - 2A + 2x = 0$.

(c) Find: $\lim_{x \to \infty} \frac{5 - 2x^2}{3x + 5x^2}$.

(d) Find the derivative of $\sqrt{x}$ from the 1st principle.

(e) Evaluate: $\int_3^5 (x^2 + 2x)\, dx$.

(f) Find the amount if Rs. 1,000 put out for 4 years @ 5% p.a. C. I.

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