



‘সমানো মন্ত্র: সমিতি: সমানী’

UNIVERSITY OF NORTH BENGAL
BBA Honours 2nd Semester Examination, 2023

CC3-BBA (203)

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) If Rs. 600 amounts to Rs. 12,680 in 16 years, interest being compounded half yearly, what is the annual interest rate? 6
- (b) If $f(x) = \frac{ax+b}{bx+a}$, then prove that $f(x)f\left(\frac{1}{x}\right) = 1$. 6
2. (a) Evaluate $\int \frac{xdx}{\sqrt{3x^2+1}}$. 6
- (b) If $y = (x + \sqrt{1+x^2})^m$, then show that $(1+x^2)\frac{d^2y}{dx^2} + x\frac{dy}{dx} - m^2y = 0$. 6
3. (a) Evaluate $\int \frac{1}{x^2+4x-5} dx$. 6
- (b) Find $\frac{d^2y}{dx^2}$ when $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$. 6
4. (a) A person wants to invest Rs. 100,000 for eight years. Bank A offers 12% interest per annum, compounded quarterly, while Bank B offers 12.5% compounded annually. In which bank should the person invest? 6
- (b) Solve the following set of equations using Matrix Inversion Method: 6

$$\begin{aligned} 3x + y + z &= 12 \\ 2x - y - 3z &= 7 \\ 5x + y + 2z &= 16 \end{aligned}$$

GROUP-B

5. Answer any **four** questions from the following:

6×4 = 24

- (a) If $y = 2x + \frac{4}{x}$ prove that $x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} - y = 0$.
- (b) Find the amount of an annuity of Rs. 100 in 20 years allowing compound interest @ $4\frac{1}{2}\%$.
- (c) Evaluate $\int x^2 \log x \, dx$.
- (d) Evaluate $\lim_{x \rightarrow 1} \frac{x^2 - 1}{\sqrt{3x+1} - \sqrt{5x-1}}$.
- (e) If $A = \begin{pmatrix} 1 & 8 \\ 0 & -5 \end{pmatrix}$, $B = \begin{pmatrix} -2 & 4 \\ 1 & 3 \end{pmatrix}$, verify $(AB)^T = B^T A^T$.
- (f) Given the total cost function of a firm as $C = 15x - 6x^2 + x^3$. Find the output levels at which AC and MC are minimum.

GROUP-C

6. Answer any **four** questions from the following:

3×4 = 12

- (a) Given $A = \begin{bmatrix} 2 & -1 & 3 \\ 1 & 3 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 3 & -2 & 1 \\ 2 & 4 & 3 \end{bmatrix}$ Find $(A + B)$.
- (b) Find the area of the bounded by the curve $y = 3x^2$, the x -axis and the ordinates $x = 1$ and $x = 3$.
- (c) If $f(x) = \frac{|x|}{x}$ does $\lim_{x \rightarrow 0} f(x)$ exist?
- (d) Show that the maximum value of the function $x + \frac{1}{x}$ is less than its minimum value.
- (e) Without expansion prove that $\begin{vmatrix} bc & a & a^2 \\ ca & b & b^2 \\ ab & c & c^2 \end{vmatrix} = \begin{vmatrix} 1 & a^2 & a^3 \\ 1 & b^2 & b^3 \\ 1 & c^2 & c^3 \end{vmatrix}$
- (f) Annual rate of interest = 10% p.a. and interest is payable half-yearly basis. Calculate the effective rate of return.

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