

June : 2026

MATHEMATICS

Paper: GEC-MTH-201

BUSINESS MATHEMATICS**Time: 2 1/2 Hours****Total Mark: 60**

(The figures in the right margin indicate full marks of the questions)

1. a) Define an upper triangular matrix with an example. 1
 b) If matrix A is of order 2×3 and matrix B is of order 3×4 , write the order of the product matrix AB ? Is the product BA defined?

1+1=2

- c) For the matrices $P = \begin{bmatrix} 4 & 2 \\ 0 & -1 \end{bmatrix}$ and $Q = \begin{bmatrix} 2 & 5 \\ -3 & 1 \end{bmatrix}$, find

$$P - Q^T.$$

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- d) Answer any two:

5+5=10

- i) Sheena, Reena and Meena purchased biscuits of different brands X, Y and Z. Sheena purchased 20 packets of X, 5 packets of Y and 3 packets of Z. Reena purchased 4 packets of X, 8 packets of Y and 10 packets of Z. Meena purchased 5 packets of X, 10 packets of Y and 4 packets of Z. If brand X costs Rs. 2, Y costs Rs. 3 and Z costs Rs. 5, then using matrix operations, find the amount of money spent by the three persons individually.

- ii) Find the inverse of the matrix A where

$$A = \begin{bmatrix} 1 & 0 & 3 \\ 4 & -1 & 2 \\ 1 & 3 & 1 \end{bmatrix}.$$

iii) Find the inverse of the matrix PQ where

$$P = \begin{bmatrix} 1 & 1 \\ 0 & -1 \end{bmatrix}, Q = \begin{bmatrix} 2 & 1 \\ 0 & 1 \end{bmatrix}.$$

2. a) Define a continuous function in $\mathbb{R}$. Give an example. $1+1=2$
 - b) Find the derivative of the following functions with respect to x
 - i) $y = 6e^{2x+3}$ ii) $y = (x^2 + 1)(x + 5)$ $2+2=4$
 - c) If the supply function of a commodity is $q = 100 + 4p$, find the price elasticity of supply when the price is $p = 10$. 3
 - d) Answer *any two*: $5+5=10$
 - i) Briefly explain the concepts of limit of a real function with the help of an example.
 - ii) The total cost function for producing x units of a commodity is given by $C(x) = 100 + 5x + 0.5x^2$. Find the Average cost. Also, find the Marginal Cost when 20 units are produced and interpret the result.
 - iii) A firm's demand function is given by $p=100-2x$ and its total cost function is $C(x) = 20x + 100$. Formulate the profit function and use second-order derivatives to determine the number of units x that must be produced and sold to maximize profit.
3. a) Define nominal rate of interest. 1
 - b) Differentiate between compounding and discounting of a sum. 2
 - c) Calculate the simple interest accrued on a principal of Rs. 10,000 at an interest rate of 6% per annum over a period of 4 years. 3
 - d) Find the effective rate of interest corresponding to a nominal rate of 10% per annum compounded semi-annually. 3
 - e) A person invests Rs. 50,000 in a bank account that pays an interest of 8% per annum. Calculate the total amount

accumulated after 1 year if the interest is compounded (a) annually, and (b) semi-annually. 6

Or

A father wishes to accumulate Rs. 1,00,000 for his daughter's higher education, which will be needed exactly 2 years from now. How much money should he deposit today in a bank that offers an interest rate of 9% compounded annually? 6

4. a) Define the term "feasible region" in a Linear Programming Problem. 1
- b) State True or False: The objective function in a Linear Programming Problem is always a linear function. 1
- c) Draw the feasible region bounded by the following set of constraints:

$$2x + y \leq 8, \quad x \leq 4, x \geq 0, y \geq 0.$$
 3
- d) Answer *any one*: 6
 - i) Find the graphical solution to the following LPP:
 Maximize: $Z = 3x_1 + 2x_2$
 subject to

$$\begin{aligned} x_1 + x_2 &\leq 4 \\ x_1 - x_2 &\leq 2 \\ x_1, x_2 &\geq 0. \end{aligned}$$
 - ii) Find the graphical solution to the following LPP:
 Minimize: $Z = 3x_1 + 5x_2$
 subject to

$$\begin{aligned} x_1 + 3x_2 &\geq 4 \\ x_1 + x_2 &\geq 2 \\ x_1, x_2 &\geq 0. \end{aligned}$$