

THE O.P. GUPTA

ADVANCED MATH CLASSES

Class XII - Mathematics (041)

Topics - Matrices

Alpha Test Series-1

(For Academic session 2025-26)

Max. Marks - 30

Time - 60 Minutes

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Followings are of 2 Marks each (Q01-05).

Q01. Determine a matrix X such that $2A + 3B + X = O$, where $A = \begin{pmatrix} 7 & -2 \\ -5 & 4 \end{pmatrix}$ and $B = \begin{pmatrix} 3 & 2 \\ 1 & -5 \end{pmatrix}$.

Q02. Let A be a 2×2 matrix, whose elements are given by $a_{ij} = \begin{cases} |i-2j|, & \text{if } i \neq j \\ 3i+j, & \text{if } i = j \end{cases}$.

Then find the value of x , where $x = 4 \left(\frac{a_{12} + a_{21} + a_{22}}{a_{11}} \right)$.

Q03. Find the value of $(b-a)^{c+d}$, if $\begin{bmatrix} 2a+b & a-2b \\ 5c-d & 24 \end{bmatrix} = \begin{bmatrix} 4 & -3 \\ 11 & 4c+3d \end{bmatrix}$.

Q04. For $A = \begin{bmatrix} -2 & 1 \\ -1 & -1 \end{bmatrix}$, the sum of the diagonal elements in A^{12} is $m \times (9)^n$; $m, n \in \mathbb{N}$, $m < n$. Then write the value of $(m+n)$.

Q05. Show that the matrix $B^T A B$ is symmetric matrix or skew-symmetric matrix, according as the matrix A is symmetric matrix or skew-symmetric matrix. [2 \times 5 = 10]

Followings are of 3 Marks each (Q06-07).

Q06. Find matrix A and B , if $A + B = \begin{bmatrix} 1 & 1 & -1 \\ 0 & 2 & 3 \\ -2 & 0 & -3 \end{bmatrix}$, $A + 2B = \begin{bmatrix} -1 & 1 & -1 \\ 4 & 0 & 5 \\ 2 & -2 & -3 \end{bmatrix}$.

Q07. Express the matrix $\begin{bmatrix} 1 & 2 & 0 \\ -3 & 1 & 6 \\ 4 & -2 & 5 \end{bmatrix}$ as the sum of a symmetric and a skew-symmetric matrix.

OR

Find the value of x , such that $\begin{bmatrix} x & 4 & -1 \end{bmatrix} \begin{bmatrix} 2 & 1 & -1 \\ 1 & 0 & 0 \\ 2 & 2 & 4 \end{bmatrix} \begin{bmatrix} x \\ 4 \\ -1 \end{bmatrix} = O$, if $x \in \mathbb{Z}$. [3 \times 2 = 6]

Following is of 4 Marks (Q08).

Q08. **PASSAGE BASED QUESTION :** Let $A = [a_{ij}]_{m \times n}$ and $B = [b_{ij}]_{m \times n}$ be two matrices.

Then $A + B$ is always of order $m \times n$ and it is given by $A + B = [a_{ij} + b_{ij}]_{m \times n}$.

Also if $A = [a_{ij}]_{m \times n}$ and $B = [b_{jk}]_{n \times p}$ are two matrices, then AB is of order $m \times p$.

Based on the information given above, answer the following questions.

(i) Find the matrix $A + B + C$, if $A = \begin{bmatrix} 1 & 2 & -1 \\ 0 & 3 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 0 & -2 & 1 \\ 1 & 3 & 5 \end{bmatrix}$ and $C = \begin{bmatrix} -3 & 2 & 1 \\ 3 & -6 & -7 \end{bmatrix}$.

(ii) Imagine you have two matrices, one of dimension 3×3 and the other of dimension 3×2 . Is it possible to add these matrices together? Explain your reasoning.

(iii) Let $A = \begin{bmatrix} 1 & 2 & 6 \\ 0 & 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -1 \\ 6 & 97 \end{bmatrix}$. In the product BA , write the pre-factor matrix.

(iv) Let $A = \begin{bmatrix} 1 & 2 & -1 \\ 3 & 0 & 5 \end{bmatrix} \begin{bmatrix} -1 & 3 & 51 \\ 49 & 6 & -9 \\ 7 & -2 & 10 \end{bmatrix} \begin{bmatrix} 5 \\ 6 \\ 3 \end{bmatrix}$. Write the order of matrix A . [1 \times 4 = 4]

Followings are of 5 Marks each (Q09-10).

Q09. Find the values of x, y, z if the matrix $A = \begin{pmatrix} 0 & 2y & z \\ x & y & -z \\ x & -y & z \end{pmatrix}$ satisfies the equation $A' = A^{-1}$.

Q10. If $A = \begin{bmatrix} 0 & 6 & 7 \\ -6 & 0 & 8 \\ 7 & -8 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 2 \\ 1 & 2 & 0 \end{bmatrix}$ and $C = \begin{bmatrix} 2 \\ 2 \\ 3 \end{bmatrix}$, then verify that $(A + B)C = AC + BC$.

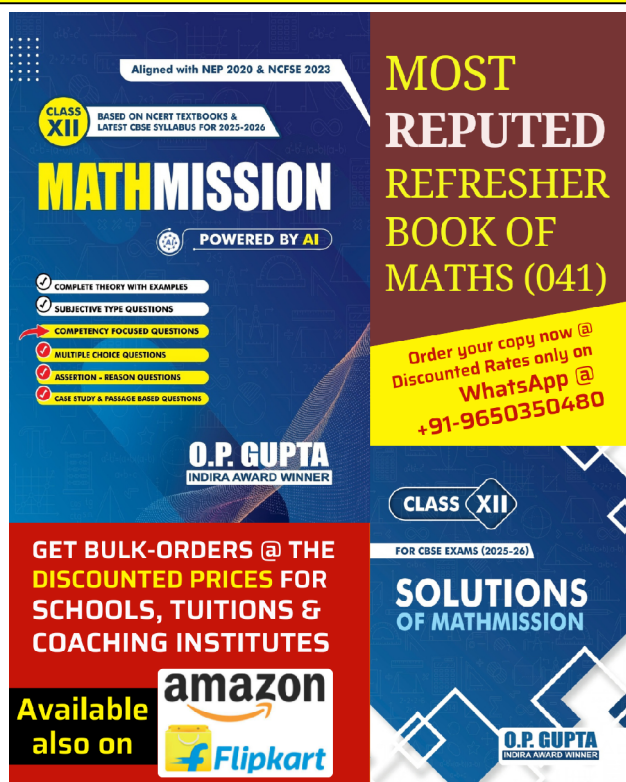
OR

If $A = \begin{bmatrix} 3 & 1 \\ 7 & 5 \end{bmatrix}$, then find $(x + y)$ so that $A^2 - xI + yA = O$. Hence find A^{-1} . [5 × 2 = 10]

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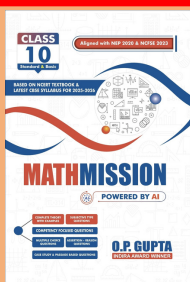
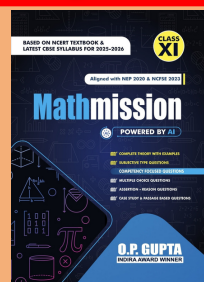
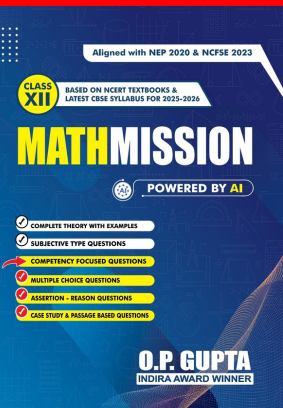
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