PRACTICE PAPER 01 (2026-27)
CHAPTER 03 : MATRICES

SUBJECT: MATHEMATICS	**MAX. MARKS:** 40
CLASS: XII	**DURATION:** 1½ hrs

General Instructions:

(i) All questions are compulsory.

(ii) This question paper contains 20 questions divided into five Sections A, B, C, D and E.

(iii) Section A comprises 10 MCQs of 1 mark each (Q9 and Q10 are Assertion–Reason questions). Section B comprises 4 questions of 2 marks each. Section C comprises 3 questions of 3 marks each. Section D comprises 1 question of 5 marks with an internal choice. Section E comprises 2 case study based questions of 4 marks each, with internal choice in the last sub-part.

(iv) There is no overall choice. Internal choices have been provided where indicated.

(v) Use of calculators is not permitted.

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. If $A = [a_{ij}]$ is a 3×3 matrix defined by $a_{ij} = i^2 - j^2$, then A is

(a) a symmetric matrix but not skew-symmetric (b) a skew-symmetric matrix (c) a scalar matrix (d) the identity matrix

2. If $\begin{bmatrix} x+y & 2 \\ 5 & xy \end{bmatrix} = \begin{bmatrix} 6 & 2 \\ 5 & 8 \end{bmatrix}$, then the value of $x^2 + y^2$ is

(a) 52 (b) 36 (c) 20 (d) 28

3. A is a matrix of order 4×3 and B is a matrix such that both AB' and $B'A$ are defined. Then the order of B is

(a) 4×3 (b) 3×4 (c) 4×4 (d) 3×3

4. If $A = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$, then A^{2026} is equal to

(a) I (b) A (c) $-A$ (d) $-I$

5. If A is a square matrix such that $A^2 = A$, then $(A + I)^2 - 3A$ is equal to

(a) A (b) I (c) 3A (d) O

6. If A is a symmetric matrix and B is a skew-symmetric matrix of the same order, then $AB - BA$ is

(a) a symmetric matrix (b) a skew-symmetric matrix (c) a null matrix (d) an identity matrix

7. The inverse of the matrix $\begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$ is

(a) $\begin{bmatrix} 1 & 0 \\ 2 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} -1 & -2 \\ 0 & -1 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & -2 \\ 0 & 1 \end{bmatrix}$

8. If A, B, C are invertible matrices of the same order, then $(ABC)^{-1}$ is equal to

(a) $A^{-1}B^{-1}C^{-1}$ (b) $C^{-1}A^{-1}B^{-1}$ (c) $C^{-1}B^{-1}A^{-1}$ (d) $B^{-1}C^{-1}A^{-1}$

For Q9 and Q10, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true but R is not the correct explanation of A.

(c) A is true but R is false.

(d) A is false but R is true.

9. Assertion (A): If A and B are matrices such that AB = O, then A = O or B = O.

Reason (R): For real numbers a and b, ab = 0 implies a = 0 or b = 0.

10. Assertion (A): Every square matrix can be expressed as the sum of a symmetric matrix and a skew-symmetric matrix.

Reason (R): For every square matrix A, ½(A + A′) is symmetric and ½(A − A′) is skew-symmetric.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. Find x and y if $2\begin{bmatrix} 1 & 3 \\ 0 & x \end{bmatrix} + \begin{bmatrix} y & 0 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 5 & 6 \\ 1 & 10 \end{bmatrix}$.

12. If $A = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -1 & 4 \end{bmatrix}$, find AB and BA. Is AB = BA? Give a reason.

13. If A is a square matrix, prove that A + A′ is a symmetric matrix.

14. If $\begin{bmatrix} a & b \\ -b & a \end{bmatrix}^2 = \begin{bmatrix} -3 & 4 \\ -4 & -3 \end{bmatrix}$ and a, b > 0, find the values of a and b.

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. If $A = \begin{bmatrix} 1 & 2 \\ -2 & 1 \end{bmatrix}$, show that $A^2 - 2A + 5I = O$. Hence find A^{-1}.

16. Express the following matrix as the sum of a symmetric matrix and a skew-symmetric matrix:

$$B = \begin{bmatrix} 2 & 5 & -1 \\ 3 & -4 & 6 \\ 1 & 2 & 0 \end{bmatrix}$$

17. If $A = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$, prove by the principle of mathematical induction that

$A^n = \begin{bmatrix} 1+2n & -4n \\ n & 1-2n \end{bmatrix}$ for every natural number n.

SECTION – D

Question 18 carries 5 marks.

18. Let $A = \begin{bmatrix} 2 & 1 \\ 5 & 3 \end{bmatrix}$. Find a matrix B such that AB = I and verify that BA = I.

Hence show that $(A')^{-1} = (A^{-1})'$.

OR

Find the matrix X such that $\begin{bmatrix} 1 & 2 \\ 3 & 5 \end{bmatrix} X = \begin{bmatrix} 1 & 0 \\ 3 & 1 \end{bmatrix}$ and verify your answer.

SECTION – E (Case Study Based Questions)

Questions 19 and 20 carry 4 marks each.

19. A stationery company has two branches. The number of items sold by each branch in a month, and the selling price and cost price (in ₹) of each item are given in the tables below.

Branch	Notebooks	Pens	Geometry boxes
Branch 1	40	60	10
Branch 2	50	30	20

Item	Notebook	Pen	Geometry box
Selling price (₹)	45	12	80
Cost price (₹)	38	9	65

Based on the above information, answer the following questions:

(i) Let S be the matrix of items sold (rows: branches) and P the column matrix of selling prices. Write the orders of S, P and SP. (1)

(ii) Find the revenue of each branch using matrix multiplication. (1)

(iii) Find the profit of each branch using matrices. (2)

OR

(iii) Next month every branch sells 10 more units of each item. Using matrices, find the revenue of each branch next month. (2)

20. A school club uses a simple code. The letters A to Z are numbered 1 to 26. A 4-letter word is written row-wise as a 2 × 2 matrix M of numbers and is sent as the coded matrix C = EM.

Here $E = \begin{bmatrix} 1 & 2 \\ 1 & 3 \end{bmatrix}$ and the receiver decodes using $D = \begin{bmatrix} 3 & -2 \\ -1 & 1 \end{bmatrix}$.

Based on the above information, answer the following questions:

(i) Write the matrix M for the word MATH. (1)

(ii) Find the coded matrix C for the word MATH. (1)

(iii) Show that D is the inverse of E and decode $R = \begin{bmatrix} 32 & 37 \\ 44 & 53 \end{bmatrix}$. (2)

OR

(iii) Find E' and show that $(E')^{-1} = (E^{-1})'$. (2)

— End of Question Paper —