

## BRAIN INTERNATIONAL SCHOOL

**SUBJECT : MATHEMATICS**

**CLASS : XII**

**APRIL 2021**

### **CHAPTER : MATRICES , DETERMINANTS**

Q1. Write the number of all possible matrices of order  $2 \times 2$  with each entry 1, 2 or 3.

Q2. If  $\begin{bmatrix} x \cdot y & 4 \\ z + 6 & x + y \end{bmatrix} = \begin{bmatrix} 8 & w \\ 0 & 6 \end{bmatrix}$ , write the value of  $(x + y + z)$ .

Q3. If A is a square matrix such that  $A^2 = I$ , then find the simplified value of  $(A - I)^3 + (A + I)^3 - 7A$ .

Q4. If  $A = \begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{bmatrix}$ , find  $A^2 - 5A + 4I$  and hence find a matrix X such that  $A^2 - 5A + 4I + X = 0$ .

Q5. Express the following matrix as the sum of a symmetric and skew symmetric matrix and verify your result.  $A = \begin{bmatrix} 3 & -2 & -4 \\ 3 & -2 & -5 \\ -1 & 1 & 2 \end{bmatrix}$ .

Q6. Using elementary transformations, find the inverse of the matrix  $\begin{bmatrix} 1 & 3 & -2 \\ -3 & 0 & -1 \\ 2 & 1 & 0 \end{bmatrix}$ .

Q7. Find the maximum value of  $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1 + \sin \theta & 1 \\ 1 & 1 & 1 + \cos \theta \end{vmatrix}$ .

Q8. In the interval  $\pi/2 < x < \pi$ , find the value of  $x$  for which the matrix  $\begin{bmatrix} 2 \sin x & 3 \\ 1 & 2 \sin x \end{bmatrix}$  is singular.

Q9. Using properties of determinants, prove the following

$$\begin{vmatrix} x^2 + 1 & xy & xz \\ xy & y^2 + 1 & yz \\ xz & yz & z^2 + 1 \end{vmatrix} = 1 + x^2 + y^2 + z^2.$$

Q10. Determine the product  $\begin{bmatrix} -4 & 4 & 4 \\ -7 & 1 & 3 \\ 5 & -3 & -1 \end{bmatrix} \begin{bmatrix} 1 & -1 & 1 \\ 1 & -2 & -2 \\ 2 & 1 & 3 \end{bmatrix}$  and use it to solve the system of equations  $x - y + z = 4$ ;  $x - 2y - 2z = 9$ ;  $2x + y + 3z = 1$ .

Q11. Using properties of determinants, prove the following

$$\begin{vmatrix} b + c & a - b & a \\ c + a & b - c & b \\ a + b & c - a & c \end{vmatrix} = 3abc - a^3 - b^3 - c^3.$$

Q12. Prove that  $\begin{vmatrix} yz - x^2 & zx - y^2 & xy - z^2 \\ zx - y^2 & xy - z^2 & yz - x^2 \\ xy - z^2 & yz - x^2 & zx - y^2 \end{vmatrix}$  is divisible by  $(x + y + z)$ , and hence find the quotient.

Q13. Using properties of determinant, show the following

$$\begin{vmatrix} (b+c)^2 & ab & ca \\ ab & (a+c)^2 & bc \\ ac & bc & (a+b)^2 \end{vmatrix} = 2abc(a+b+c)^3.$$

Q14. Find the equation of the line joining  $A(1, 3)$  and  $B(0, 0)$  using determinants and find the value of  $k$  if  $D(k, 0)$  is a point such that area of  $\triangle ABD$  is 3 square units.

Q15. Using properties of determinants, prove that  $\begin{vmatrix} (a+1)(a+2) & a+2 & 1 \\ (a+2)(a+3) & a+3 & 1 \\ (a+3)(a+4) & a+4 & 1 \end{vmatrix} = 2.$