Chapter 3

Matrix

1 Mark Questions

Q1 **Write the number of possible matrices which can be made if it has 12 elements.**

Q2 **Let A = [a_{ij}] be a matrix of order 2 x 3 and**

$$a_{ij} = \frac{i-j}{i+j}, \quad \text{write the value of } a_{23}.$$

Q3 **If** $\begin{bmatrix} a+b & 2 \\ 5 & ab \end{bmatrix} = \begin{bmatrix} 6 & 2 \\ 5 & 8 \end{bmatrix}$ **find the relation between a and b.**

Q4 **If following information regarding the number of men and women workers in three factories I, II and III is written in the form of 3 x 2 matrix. What does the entry in third row and second column represent?**

	Men workers	Women workers
Factory I	30	25
Factory II	25	31
Factory III	27	26

Q5 **If,** $A = [a_{ij}] = \begin{bmatrix} 2 & 3 & -5 \\ 1 & 4 & 9 \\ 0 & 7 & -2 \end{bmatrix}$ **and** $B = [b_{ij}] = \begin{bmatrix} 2 & -1 \\ -3 & 4 \\ 1 & 2 \end{bmatrix}$

Write the value of **(i)** $a_{22} + b_{21}$

(ii) $a_{11} b_{11} + a_{22} b_{22}$

Q6 **Is it possible to have the product of two matrices to be the null matrix** while neither of them is the null matrix? If it is so, give an example.

Q7 **Under what conditions is the matrix equation**

$$A^2 - B^2 = (A-B)(A+B) \text{ is true.}$$

Q8 **Write the order of matrix B if A is any matrix of order m x n such that**

AB and BA both are defined.

Q10 **If** $\mathbf{A} = \begin{bmatrix} -1 & 2 & -5 \end{bmatrix}$ $\mathbf{B} = \begin{bmatrix} 2 \\ -1 \\ 7 \end{bmatrix}$

write the orders of AB and BA.

Q11 **Give an example of two non-zero matrices A and B such that**

$AB = 0$ but $BA \neq 0$.

Q12 If $A = \begin{bmatrix} 0 & 0 \\ -1 & 0 \end{bmatrix}$ find A^6.

Q13 **If** $\mathbf{A} = \begin{bmatrix} \alpha & \beta \\ \gamma & -\alpha \end{bmatrix}$ **and** $\mathbf{A}^2 = \mathbf{I}$, find the value of $\alpha^2 + \beta\gamma$

Q14 **If** $\mathbf{A} = \begin{bmatrix} \sin x & -\cos x \\ \cos x & \sin x \end{bmatrix}$

$0 < x < \frac{\pi}{2}$ **and** $\mathbf{A} + \mathbf{A}' = \mathbf{I}$,

where I is unit matrix, find value of x.

Q15 **If the following matrix is skew symmetric, find the values of a, b, c.**

$$\mathbf{A} = \begin{bmatrix} 0 & a & 3 \\ 2 & b & -1 \\ c & 1 & 0 \end{bmatrix}$$

Q16 **If A and B are symmetric matrices and AB = BA, prove that matrix X = AB is also symmetric.**

Q17 **If A and B are square matrices of same order and B is symmetric, show that** $\mathbf{A}'$ **BA is also symmetric.**

Q18 **Give an example of a matrix which is both symmetric and skew symmetric**

Q19 $\begin{bmatrix} 2 & 3 \\ 1 & 0 \end{bmatrix}$ **= P + Q, where P is symmetric and Q is skew symmetric matrix, find the matrices P and Q.**

Q20 **If A is square matrix then write the value of A(AdjA)**

<u>4 Mark Questions</u>

Q1 **For what values of x and y are the following matrices equal**

$$\mathbf{A} = \begin{bmatrix} 2x+1 & 3y \\ 0 & y^2-5y \end{bmatrix} \qquad \mathbf{B} = \begin{bmatrix} x+3 & y^2+2 \\ 0 & -6 \end{bmatrix}$$

Q2 **Find matrix A such that 2A-3B+5C = 0 where,**

$$\mathbf{B} = \begin{bmatrix} -2 & 2 & 0 \\ 3 & 1 & 4 \end{bmatrix} \qquad \mathbf{C} = \begin{bmatrix} 2 & 0 & -2 \\ 7 & 1 & 6 \end{bmatrix}$$

Q3 **Find the values of x and y for which the following matrix equation**

A-3B = C is satisfied, where

$$\mathbf{A} = \begin{bmatrix} x^2 \\ y^2 \end{bmatrix} \qquad \mathbf{B} = \begin{bmatrix} x \\ 2y \end{bmatrix} \qquad \mathbf{C} = \begin{bmatrix} -2 \\ 9 \end{bmatrix}$$

Q4 **Let $f(x) = x^2 - 5x + 6$, find f(A)**

$$\textbf{If,}\quad \mathbf{A} = \begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{bmatrix}$$

5. If, $\mathbf{A} = \begin{bmatrix} \alpha & 0 \\ 1 & 1 \end{bmatrix}$ **and** $\mathbf{B} = \begin{bmatrix} 1 & 0 \\ 5 & 1 \end{bmatrix}$ **find all those values of α for which**

A=B.

Q6 **. Using Principle of Mathematical Induction, prove that**

$$\mathbf{A}^n = \begin{bmatrix} 1+2n & -4n \\ n & 1-2n \end{bmatrix} \qquad \textbf{Where,} \qquad \mathbf{A} = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$$

6 Mark Questions

Q1 If $A = \begin{bmatrix} 3 & 1 \\ 7 & 5 \end{bmatrix}$ find x, y such that $A^2 + xI = yA$

Hence find A^{-1}.

Q2 . If $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$ Prove that, $A = \begin{bmatrix} 3^{n-1} & 3^{n-1} & 3^{n-1} \\ 3^{n-1} & 3^{n-1} & 3^{n-1} \\ 3^{n-1} & 3^{n-1} & 3^{n-1} \end{bmatrix}$ for every positive integer n.

Q3 The sum of three numbers is -1. If we multiply the second number by 2 , third number by 3 and add them we get 5. If we subtract the third number from the sum of first and second numbers we get -1. Represent it by a system of equations . Find the three numbers using inverse of a matrix .

Q4 If $A(x_1,y_1)$, $B(x_2,y_2)$ and $C(x_3,y_3)$ are the vertices of an equilateral triangle with each side equal to 'a' units, prove that,

$$\begin{vmatrix} x_1 & y_1 & z_1 \\ x_2 & y_2 & z_2 \\ x_3 & y_3 & z_3 \end{vmatrix} = \sqrt{3}\ a^2$$

Answers: Matrix

1 Mark Questions

Q1 6

Q2 -1/5

Q3 a=2b { a=4, b=2}

Q4 Number of women workers in factory III.

Q5 1, 20

Q6 $A=\begin{bmatrix} 0 & 2 \\ 0 & 0 \end{bmatrix}$ $B=\begin{bmatrix} 1 & O \\ O & O \end{bmatrix}$ $AB=\begin{bmatrix} 0 & 2 \\ 0 & 0 \end{bmatrix}$

Q7 AB = BA ie, if the matrices A & B commute with each other.

Q8 n x m

Q9 $k = 4, a = -4, b = -10, c = 0$

Q10 $1 \times 1, \quad 3 \times 3,$

Q10 $A = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ $\quad B = \begin{bmatrix} 0 & 0 \\ 1 & 0 \end{bmatrix}$

Q12 $A^6 = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

Q13 $\alpha^2 + \beta\gamma = 1$

Q14 $x = \pi/6$

Q15 $a = -2, b = 0, c = -3$

Q18 **Null Matrix**

Q19 $P=\begin{bmatrix} 2 & 2 \\ 2 & 0 \end{bmatrix} \quad Q = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$

Q20 $|A|\ I$

4 Marks Questions

Q1 $x=2, \; y=2$

Q2 $A=\begin{bmatrix} -8 & 3 & 5 \\ -13 & -1 & -9 \end{bmatrix}$

Q3 $x=1, 2 \qquad y= 3\pm3\sqrt{2}$

Q4 $f(A) = \begin{bmatrix} 1 & -1 & -3 \\ -1 & -1 & -10 \\ -5 & 4 & 4 \end{bmatrix}$

Q5 **No values of α can be found for which $A^2 = B$ is true.**

Q6 **order of A=2 x 3**

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

6 Mark Questions

Q1 $x = 8 \quad y = 8$

Q2 $A^{-1} = \frac{1}{8}\begin{bmatrix} 5 & -1 \\ -7 & 3 \end{bmatrix}$

Q3 **Let numbers be x, y, z then**

$$x + y + z = -1$$

$$2y + 3z = 5$$

$$x + y - z = -1$$

Ans $x = -\frac{7}{2}$, $y = \frac{5}{2}$, $z = 0$