

## MATRICES

---

### ONE MARKS QUESTIONS

1. Show by means of an example that the product of two non-zero matrices can be a zero matrix.
2. Construct a  $3 \times 2$  matrix whose elements are given by  $a_{ij} = e^{ix} \sin jx$ . (Exemplar)
3. Solve for  $x$  and  $y$  for  $x \begin{bmatrix} 2 \\ 1 \end{bmatrix} + y \begin{bmatrix} 3 \\ 5 \end{bmatrix} + \begin{bmatrix} -8 \\ -11 \end{bmatrix} = 0$  (Exemplar).
4. Give an example of matrices  $A, B$  and  $C$  such that  $AB = AC$ , Where  $A$  is non-zero matrix, but  $B \neq C$ .
5. Show that  $A^T A$  and  $AA^T$  are both symmetric matrices for any matrix  $A$ . (Exemplar).

### FOUR MARKS QUESTIONS

6. If  $A = \begin{pmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{pmatrix}$  prove that  $A^2 - 4A - 5I = 0$ . Hence find  $A^{-1}$
  7. Given  $A = \begin{pmatrix} 3 & -4 \\ 1 & -1 \end{pmatrix}$  show by induction that  $A^n = \begin{pmatrix} 1 + 2n & -4n \\ n & 1 - 2n \end{pmatrix}$
  8. If  $X = \begin{bmatrix} 3 & 1 & -1 \\ 5 & -2 & -3 \end{bmatrix}$  and  $Y = \begin{bmatrix} 2 & 1 & -1 \\ 7 & 2 & 4 \end{bmatrix}$ , Find a matrix  $Z$  such that  $X+Y+Z$  is a zero matrix. (Exemplar).
  9. Find the matrix  $A$  satisfying the matrix equation :  
 $\begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix} A \begin{bmatrix} -3 & 2 \\ 5 & -3 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ . (Exemplar).
  10. Prove by mathematical induction that  
 $(A^T)^n = (A^n)^T$ , where  $n \in N$  for any square matrix  $A$ . (Exemplar).
  11. If  $F(\theta) = \begin{pmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{pmatrix}$  show that  $F(\theta)F(\varphi) = F(\theta + \varphi)$ .
  12. Find the inverse by elementary Operations  $\begin{bmatrix} 2 & -1 & 3 \\ 1 & 3 & -1 \\ 3 & 2 & 1 \end{bmatrix}$ .
  13. Express the matrix  $\begin{bmatrix} 2 & 3 & 1 \\ 1 & -1 & 2 \\ 4 & 1 & 2 \end{bmatrix}$  as the sum of a symmetric and skew symmetric matrix.  
(Exemplar).
  14. Find the value of  $x$ , if  
 $\begin{bmatrix} 1 & x & 1 \end{bmatrix} \begin{bmatrix} 1 & 3 & 2 \\ 2 & 5 & 1 \\ 15 & 3 & 2 \end{bmatrix} \begin{bmatrix} 1 \\ 2 \\ x \end{bmatrix} = 0$ .
-