

19. Compute the elements  $a_{43}$  and  $a_{22}$  of the matrix:

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

20. If  $A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ p & q & r \end{bmatrix}$  and  $I$  is the identity matrix of order 3, show that  $A^3 = pI + qA + rA^2$ .

21. If  $w$  is a complex cube root of unity, show that

$$\left( \begin{bmatrix} 1 & w & w^2 \\ w & w^2 & 1 \\ w^2 & 1 & w \end{bmatrix} + \begin{bmatrix} w & w^2 & 1 \\ w^2 & 1 & w \\ w & w^2 & 1 \end{bmatrix} \right) \begin{bmatrix} 1 \\ w \\ w^2 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$

22. If  $A = \begin{bmatrix} 2 & -3 & -5 \\ -1 & 4 & 5 \\ 1 & -3 & -4 \end{bmatrix}$ , show that  $A^2 = A$ .

23. If  $A = \begin{bmatrix} 4 & -1 & -4 \\ 3 & 0 & -4 \\ 3 & -1 & -3 \end{bmatrix}$ , show that  $A^2 = I_3$ .

24. (i) If  $[1 \ 1 \ x] \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 1 & 0 \end{bmatrix} \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} = 0$ , find  $x$ .

- (ii) If  $\begin{bmatrix} 2 & 3 \\ 5 & 7 \end{bmatrix} \begin{bmatrix} 1 & -3 \\ -2 & 4 \end{bmatrix} = \begin{bmatrix} -4 & 6 \\ -9 & x \end{bmatrix}$ , find  $x$ .

[CBSE 2012]

25. If  $[x \ 4 \ 1] \begin{bmatrix} 2 & 1 & 2 \\ 1 & 0 & 2 \\ 0 & 2 & -4 \end{bmatrix} \begin{bmatrix} x \\ 4 \\ -1 \end{bmatrix} = 0$ , find  $x$ .

26. If  $[1 \ -1 \ x] \begin{bmatrix} 0 & 1 & -1 \\ 2 & 1 & 3 \\ 1 & 1 & 1 \end{bmatrix} \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix} = 0$ , find  $x$ .

27. If  $A = \begin{bmatrix} 3 & -2 \\ 4 & -2 \end{bmatrix}$  and  $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ , then prove that  $A^2 - A + 2I = O$ .

28. If  $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$  and  $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ , then find  $\lambda$  so that  $A^2 = 5A + \lambda I$ .

29. If  $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ , show that  $A^2 - 5A + 7I_2 = O$ .

[CBSE 2003, 2007]

30. If  $A = \begin{bmatrix} 2 & 3 \\ -1 & 0 \end{bmatrix}$ , show that  $A^2 - 2A + 3I_2 = O$ .

31. Show that the matrix  $A = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$  satisfies the equation  $A^3 - 4A^2 + A = O$ . [CBSE 2005]

32. Show that the matrix  $A = \begin{bmatrix} 5 & 3 \\ 12 & 7 \end{bmatrix}$  is a root of the equation  $A^2 - 12A - I = O$ .

33. If  $A = \begin{bmatrix} 3 & -5 \\ -4 & 2 \end{bmatrix}$ , find  $A^2 - 5A - 14I$ .

[CBSE 2004]