Ques:- $Ax = B$ , $B = \begin{bmatrix} 9 \\ 52 \\ 0 \end{bmatrix}$

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

then $x = ?$

A) $\begin{bmatrix} 1 \\ 3 \\ 5 \end{bmatrix}$ B) $\begin{bmatrix} -1/2 \\ -1/2 \\ 2 \end{bmatrix}$

C) $\begin{bmatrix} -4 \\ 2 \\ 3 \end{bmatrix}$ D) $\begin{bmatrix} 3 \\ 3/4 \\ -3/4 \end{bmatrix}$

# Matrix :- $\boxed{X = A^{-1}B}$

Sol$^n$:- $\boxed{Ax = B} \rightarrow x = \frac{B}{A} = \frac{1}{A} \cdot B = A^{-1}B$

$2A \rightarrow 2 \cdot 2^{-1} A = \cancel{2} \cdot \frac{1}{\cancel{2}} A = A$

$\Rightarrow$ Multiply both side by $A^{-1}$

$\Rightarrow A^{-1}Ax = A^{-1}B$

$\Rightarrow Ix = A^{-1}B$

$\Rightarrow \boxed{x = A^{-1}B}$

So $x = \underset{3\times 3}{\begin{bmatrix} 3 & -1/2 & 1/2 \\ -4 & 3/4 & 5/4 \\ 2 & -1/4 & -3/4 \end{bmatrix}} \underset{3\times 1}{\begin{bmatrix} 9 \\ 52 \\ 0 \end{bmatrix}} = \begin{bmatrix} 27 - \frac{1}{2} \times 52 + 0 \\ -36 + \frac{3}{\cancel{4}} \times \cancel{52}^{13} + 0 \\ 18 - \frac{1}{\cancel{4}} \times \cancel{52}^{13} + 0 \end{bmatrix} = \begin{bmatrix} 27 - 26 \\ -36 + 39 \\ 18 - 13 \end{bmatrix}$

$x = \begin{bmatrix} 1 \\ 3 \\ 5 \end{bmatrix}$ A

# Matrix :

Q.1) $A = \begin{bmatrix} 0 & 2q & r \\ p & q & -r \\ p & -q & r \end{bmatrix}$

if $\boxed{AA^T = I_3}$ find $p = ?$

A) $\frac{1}{\sqrt{2}}$ B) $= \frac{1}{\sqrt{6}}$

C) $\frac{1}{\sqrt{3}}$, d) $= 0$

Sol$^n$:- $A = \begin{bmatrix} 0 & 2q & r \\ p & q & -r \\ p & -q & r \end{bmatrix} \Rightarrow A^T = \begin{bmatrix} 0 & p & p \\ 2q & q & -q \\ r & -r & r \end{bmatrix}$

$\Rightarrow AA^T = I_3 \Rightarrow \begin{bmatrix} 0+4q^2+r^2 & 2q^2-r^2 & -2q^2+r^2 \\ 2q^2-r^2 & p^2+q^2+r^2 & p^2-q^2-r^2 \\ -2q^2+r^2 & p^2-q^2-r^2 & p^2+q^2+r^2 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

$a_{12} \Rightarrow 2q^2 - r^2 = 0 \Rightarrow 2q^2 = r^2$ — (1)

$a_{22} \Rightarrow p^2 + q^2 + r^2 = 1 \Rightarrow p^2 + q^2 + 2q^2 = 1 \Rightarrow p^2 + 3q^2 = 1$ — (2)

$a_{11} = 4q^2 + r^2 = 1$

$\Rightarrow 4q^2 + 2q^2 = 1$ — from eq$^n$ (1)

$\Rightarrow 6q^2 = 1 \Rightarrow \boxed{q^2 = 1/6}$ — (3)

put $q^2$ from eq$^n$ (3) in eq$^n$ (2) :-

$\Rightarrow p^2 + 3 \cdot \frac{1}{6} = 1 \Rightarrow p^2 + \frac{1}{2} = 1$

$\Rightarrow p^2 = 1 - \frac{1}{2} = \frac{1}{2}$

$p = \frac{1}{\sqrt{2}}$ Ans

Q.2) if A, B & C are sq. matrix of same order such that:- $AB = 0$ & $BC = I$ then

$\rightarrow (A+B)^2 (A+C)^2 = ?$

A) 0 B) $2I$ C) $= I$ D) $3I$

# Matrix :

Q.31 if $A$ & $B$ are sq. matrix of order $3\times3$ which satisfy $AB = A$ & $BA = B$ then $(A+B)^6 = ?$

A) $6(A+B)$ B) $6I$ C) $32(A+B)$ D) $64I$

$a \cdot b = 0$

$a = 0$
or
$b = 0$

$AB = O$

it doesn't mean

$A = O$ or $B = 0$

$B = B^{-1}$

null matrix

$\varphi$

$AB = I$

$B = A^{-1}$

$A \cdot A^{-1} = I$

Q.21 if $A, B$ & $C$ are sq. matrix of same order such that :- $\boxed{AB = O}$ & $\boxed{BC = I}$ then

$\rightarrow (A+B)^2 (A+C)^2 = ?$

A) $0$ B) $2I$ C) $I$ D) $3I$

Sol$^n$ :- $\boxed{AB = O}$ — (1) & $\boxed{BC = I}$ — (2)

from eq$^n$ (1) :-

$\boxed{A = 0}$ or $\boxed{B = 0}$

$\varphi$

then Here $\boxed{A = 0}$

$B B^{-1} = I$

i.e. $\Rightarrow \boxed{C = B^{-1}}$ or $\boxed{B = C^{-1}}$

Here $B^{-1}$ is define

it means :- $\boxed{B = 0}$ not possible

So :- $(A+B)^2 (A+C)^2 = (0+B)^2 (0+C)^2$

$= (B)^2 (C)^2 = (BC)^2 = I^2 = I = C$ Ans

# Matrix :-

Q.31 if A & B are sq. matrix of order 3x3 which satisfy $AB = A$ & $BA = B$ then $(A+B)^6 = ?$ → $(A+B)^4 =$

A) $6(A+B)$ B) $6I$ C) $32(A+B)$ D) $64I$

Sol$^n$:-

$\boxed{AB = A}$ & $\boxed{BA = B}$

Multiply by $A^{-1}$

$\Rightarrow A^{-1} \cdot AB = A^{-1}A$

$\Rightarrow IB = I$

$\Rightarrow B = I$

Multi. by $B^{-1}$

$B^{-1} \cdot BA = B^{-1}B$

$IA = I$

$A = I$

So: $(A+B)^6 = (I+I)^6 = (2I)^6 = 2^6 \cdot I^6 = 64I$ Ans

$(I+I)^4 = (2I)^2 = 16I$ Ans

Q. $A = \begin{vmatrix} 0 & c & -b \\ -c & 0 & a \\ b & -a & 0 \end{vmatrix}$ $B = \begin{vmatrix} a^2 & ab & ac \\ ab & b^2 & bc \\ ac & bc & c^2 \end{vmatrix}$

$AB = ?$ A) A B) B C) $= 0$ D $= I$