PUSH – UP TEST – 1 | **Mathematics – XII** | **Max Marks – 80**
Units : 2 + 3 + 4 | **Time – 3 hr**

2 – Marks

$Q.1$. Find x if, $sin\left\{sin^{-1}x + cos^{-1}\left(\frac{1}{5}\right)\right\} = 1$

$Q.2$. Prove that : $\frac{9\pi}{8} - \frac{9}{4}sin^{-1}\left(\frac{1}{3}\right) = \frac{9}{4}sin^{-1}\left(\frac{2\sqrt{2}}{3}\right)$

$Q.3$. Find the value of x if $[1 \;\; x \;\; 1]\begin{bmatrix} 1 & 3 & 2 \\ 2 & 5 & 1 \\ 15 & 3 & 2 \end{bmatrix}\begin{bmatrix} 1 \\ 2 \\ x \end{bmatrix} = O$

$Q.4$. If $A = \begin{bmatrix} -2 \\ 4 \\ 5 \end{bmatrix}$ and $B = [1 \quad 3 \quad -6]$, then verify $(AB)^T = B^T.A^T$

$Q.5$. If area of triangle is $35\ sq\ units$ with vertices $(2,-6), (5,4)$ & $(k,4)$, then find the value of k.

3 – Marks

$Q.6$. Simplify : $tan^{-1}\left\{\frac{\sqrt{1+x^2}-1}{x}\right\}; |\,x\,| \neq 0$

$Q.7$. Simplify : $tan^{-1}\left\{\frac{cos\,x}{1-sin x}\right\}; -\frac{\pi}{2} < x < \frac{\pi}{2}$

$Q.8$. Show that : $sin^{-1}\left(\frac{3}{5}\right) + cos^{-1}\left(\frac{12}{13}\right) = sin^{-1}\left(\frac{56}{65}\right)$

$Q.9$. Find x if, $sin^{-1}(1-x) - 2sin^{-1}(x) = \frac{\pi}{2}$

$Q.10$. Show that: $tan^{-1}\left(\frac{\sqrt{1+x}-\sqrt{1-x}}{\sqrt{1+x}+\sqrt{1-x}}\right) = \frac{\pi}{4} - \frac{1}{2}cos^{-1}x; x \in [0\ \ 1]$

$Q.11$. Simplify : $sin^{-1}\left(2x\sqrt{1-x^2}\right)$; $\frac{1}{\sqrt{2}} < x < 1$

$Q.12$. Show that : $cot^{-1}\left\{\frac{\sqrt{1+sin x}+\sqrt{1-sin x}}{\sqrt{1+sin x}-\sqrt{1-sin x}}\right\} = \frac{x}{2}$, $x \in \left[0 \;\; \frac{\pi}{2}\right]$

$Q.13$. Use product $\begin{bmatrix} 1 & -1 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix}\begin{bmatrix} -2 & 0 & 1 \\ 9 & 2 & -3 \\ 6 & 1 & -2 \end{bmatrix}$ to solve the system of equations

$x - y + 2z = 1, 2y - 3z = 1, 3x - 2y + 4z = 2$

$Q.14$. If, $A = \begin{bmatrix} 3 & -2 \\ 4 & -2 \end{bmatrix}$, find the value of k so that $A^2 = kA - 2I$

$Q.15$. A manufacturer produces three products x, y, z which he sells in two markets. Annual sales are indicated below:

Market	*Product*: x	*Product*: y	*Product*: z
I	10,000	2,000	18,000
II	6,000	20,000	8,000

(a) If unit sale prices of x, y and z are $Rs\ 2.50$, $Rs\ 1.50$ and $Rs\ 1.00$, respectively, find the total revenue in each market with the help of matrix algebra.

(b) If the unit costs of the above three commodities are $Rs\ 2.00$, $Rs\ 1.00$ and $50\ paise$ respectively. Find the gross profit.

$Q.16$. Express the matrix $A = \begin{bmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{bmatrix}$, as sum of a symmetric and a skew – symmetric matrices.

P.T.O

$Q.17$. Find the matrix X so that $X.\begin{bmatrix}1 & 2 & 3\\ 4 & 5 & 6\end{bmatrix} = \begin{bmatrix}-7 & -8 & -9\\ 2 & 4 & 6\end{bmatrix}$

$Q.18$. If, $A = \begin{bmatrix}0 & -tan\left(\frac{\alpha}{2}\right)\\ tan\left(\frac{\alpha}{2}\right) & 0\end{bmatrix}$ and $I = \begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$ Show that, $(I + A) = (I - A)\begin{bmatrix}cos\,\alpha & -sin\,\alpha\\ sin\,\alpha & cos\,\alpha\end{bmatrix}$

$Q.19$. Find matrix D if $A = \begin{bmatrix}2 & -1\\ 3 & 4\end{bmatrix}$, $B = \begin{bmatrix}5 & 2\\ 7 & 4\end{bmatrix}$, $C = \begin{bmatrix}2 & 5\\ 3 & 5\end{bmatrix}$ if $CD - AB = O$

$Q.20$. If, $A = \begin{bmatrix}3 & -4\\ 1 & -1\end{bmatrix}$, then by using $P.M.I$, show that $A^n = \begin{bmatrix}1 + 2n & -4n\\ n & 1 - 2n\end{bmatrix}$ $\forall\, n \in \mathrm{N}$.

$5 - Marks$

$Q.21$. Solve the system of equations by matrix method. $3x - 2y + 3z = 8, 2x + y - z = 1, 4x - 3y + 2z = 4$.

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

Hence solve the following system of equations: $x + 2y - 3z = -4, 2x + 3y + 2z = 2, 3x - 3y - 4z = 11$

$Q.23$. Solve the system of linear equations using matrix method,

$\frac{2}{x} + \frac{3}{y} + \frac{10}{z} = 4, \frac{4}{x} - \frac{6}{y} + \frac{5}{z} = 1, \frac{6}{x} + \frac{9}{y} - \frac{20}{z} = 2$

$Q.24$. The cost of $4\,kg$ onion, $3\,kg$ wheat & $2\,kg$ rice is $Rs\ 60$. The cost of $2\,kg$ onion, $4\,kg$ wheat & $6\,kg$ rice is $Rs\ 90$. The cost of $6\,kg$ onion, $2\,kg$ wheat & $3\,kg$ rice is $Rs\ 70$. Find the cost of each item per kg by matrix method.

$Q.25$. The sum of three numbers is 6. If we multiply third number by 3 and add second number to it, we get 11. By adding first and third numbers, we get double of the second number. Represent it algebraically and find the numbers using matrix method.

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