THE VILLAGE
INTERNATIONAL SCHOOL
"We Nurture Dreams"

MARK:20

TIME : 1 HOUR

Q.No.	CLASS : XII Applied Mathematic Marking Scheme	Mark
	SECTION A	
1	$AB=\begin{bmatrix}1 & 0\\0 & 0\end{bmatrix}\begin{bmatrix}0 & 0\\0 & 1\end{bmatrix}$ $=\begin{bmatrix}0 & 0\\0 & 0\end{bmatrix}$ Ans: c	1
2	$A+A^T=\begin{bmatrix}1 & 2\\3 & 4\end{bmatrix}+\begin{bmatrix}1 & 3\\2 & 4\end{bmatrix}$ $=\begin{bmatrix}2 & 5\\5 & 8\end{bmatrix}$ Ans: a	1
3	$\begin{bmatrix}p+q & 2\\5 & q\end{bmatrix}=\begin{bmatrix}6 & 2\\5 & 2\end{bmatrix}$ P+q = 6 q= 2 ie. P +2=6 p=4 Ans. a	1
4	$\begin{vmatrix}2 & 2 & 14\\1 & 3 & 21\\3 & 5 & 35\end{vmatrix}$ = 2(105-105)+1(70-70)-3(42-42) =0 Ans: a	1
5	$A=A^T$ $\begin{bmatrix}5 & x\\y & 0\end{bmatrix}=\begin{bmatrix}5 & y\\x & 0\end{bmatrix}$ x=y Ans. b	1
	SECTION B	
6	$A=\begin{bmatrix}1 & 2 & 2\\2 & 1 & 2\\2 & 2 & 1\end{bmatrix}$ $A^2=A.A=\begin{bmatrix}9 & 8 & 8\\8 & 9 & 8\\8 & 8 & 9\end{bmatrix}$ $4A=4.\begin{bmatrix}1 & 2 & 2\\2 & 1 & 2\\2 & 2 & 1\end{bmatrix}=\begin{bmatrix}4 & 8 & 8\\8 & 4 & 8\\8 & 8 & 4\end{bmatrix}$ $5I=\begin{bmatrix}5 & 0 & 0\\0 & 5 & 0\\0 & 0 & 5\end{bmatrix}$ $ie.\quad A^2-4A-5I=0$	2

7	A = $\begin{bmatrix}1 & 2\\3 & -5\end{bmatrix}$ $C_{11} = (-1)^2.-5 = -5$ $C_{12} = (-1)^3.3 = -3$ $C_{21} = (-1)^3.2 = -2$ $C_{22} = (-1)^4.1 = 1$ Co factor matrix = $\begin{bmatrix}-5 & -3\\-2 & 1\end{bmatrix}$ Adj. matrix = $\begin{bmatrix}-5 & -2\\-3 & 1\end{bmatrix}$	**2**
8	A = $\begin{bmatrix}2 & 4\\3 & 2\end{bmatrix}, B = \begin{bmatrix}1 & 3\\-2 & 5\end{bmatrix}$ and $C = \begin{bmatrix}-2 & 5\\3 & 4\end{bmatrix}$ A+B = $\begin{bmatrix}3 & 7\\1 & 7\end{bmatrix}$ 3A-C =3. $\begin{bmatrix}2 & 4\\3 & 2\end{bmatrix} - \begin{bmatrix}-2 & 5\\3 & 4\end{bmatrix}$ $= \begin{bmatrix}6 & 12\\9 & 6\end{bmatrix} - \begin{bmatrix}-2 & 5\\3 & 4\end{bmatrix}$ $= \begin{bmatrix}8 & 7\\6 & 2\end{bmatrix}$	**2**
	SECTION C	
9	D= $\begin{vmatrix}6 & 1 & -3\\1 & 3 & -2\\2 & 1 & 4\end{vmatrix}$ = 6(12+2)-1(4+4)-3(1-6) = 84-8+15=91 ≠0 has a unique solution $D_1 = \begin{vmatrix}5 & 1 & -3\\5 & 3 & -2\\8 & 1 & 4\end{vmatrix} = 5(12+2) - 1(20+16) - 3(5-24)$ = 70-36+57 =91 $D_2 = \begin{vmatrix}6 & 5 & -3\\1 & 5 & -2\\2 & 8 & 4\end{vmatrix} = 6(20+16) - 5(4+4) - 3(8-10)$ = 216-40+6= 182 $D_3 = \begin{vmatrix}6 & 1 & 5\\1 & 3 & 5\\2 & 1 & 8\end{vmatrix} = 6(24-5) - 1(8-10) + 5(1-6)$ = 114+2-25=91 By cramers rule, x=$\frac{D_1}{D} = \frac{91}{91} = 1$, $y = \frac{D_2}{D} = \frac{182}{91} = 2, z = \frac{D_3}{D} = \frac{91}{91} = 1$ X=1, y= 2 , z=1	**3**
10	$\|A\| = \begin{vmatrix}1 & 2 & -2\\-1 & 3 & 0\\0 & -2 & 1\end{vmatrix} = 1 \neq 0$ A is non singular, hence A^{-1} exists $A_{11} = (-1)^2 \begin{vmatrix}3 & 0\\-2 & 1\end{vmatrix} = 3$ $A_{12} = 1$ $A_{13} = 2$ $A_{21} = 2$ $A_{22} = 1$ $A_{23} = 2$ $A_{31} = 6$ $A_{32} = 2$ $A_{33} = 5$	**3**

	Adj. A = $\begin{bmatrix} 3 & 2 & 6 \\ 1 & 1 & 2 \\ 2 & 2 & 5 \end{bmatrix}$ $A^{-1} = \frac{1}{\lvert A \rvert}(adj.A) = \begin{bmatrix} 3 & 2 & 6 \\ 1 & 1 & 2 \\ 2 & 2 & 5 \end{bmatrix}$ A× $A^{-1} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = I$ $A^{-1} \times A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = I$ $\quad A.A^{-1} = A^{-1}.A = I$	
11	**CASE STUDY** Producing sector / Receiving sector I / Receiving sector II / Final demand I | 264 | 410 | 206 II | 528 | 204 | 292 a) $x_{11} = 264 \quad x_{12} = 410 \quad x_{21} = 528 \quad x_{22} = 204$ $d_1 = 206 \quad d_2 = 292 \quad X_1 = 880 \quad X_2 = 1024$ $technical\ coefficients$ $a_{11} = \frac{x_{11}}{X_1} = 0.3 \quad a_{12} = \frac{x_{12}}{X_2} = 0.4$ $a_{21} = \frac{x_{21}}{X_1} = 0.6 \quad a_{22} = \frac{X_{22}}{X_2} = 0.1$ b) matrix of technical coefficients. A=$\begin{bmatrix} 0.3 & 0.4 \\ 0.6 & 0.1 \end{bmatrix}$ **c)** Leontief matrix= I-A=$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} - \begin{bmatrix} 0.3 & 0.4 \\ 0.6 & 0.1 \end{bmatrix}$ =$\begin{bmatrix} 0.7 & -0.4 \\ -0.6 & 0.9 \end{bmatrix}$	**1** **1** **1**

Prepared by Checked by