CHAPTER-3

MATRICES

01 MARK TYPE QUESTIONS

Q. NO	QUESTION	MARK
1.	In a certain city there are 30 colleges. Each college has 15 peons, 6 clerks, 1 typist and 1 section officer. Express the given information as a column matrix. A) $\begin{bmatrix}15\\1\\1\\6\end{bmatrix}$ B) $\begin{bmatrix}15\\6\\1\\1\end{bmatrix}$ C) $\begin{bmatrix}6\\15\\1\\1\end{bmatrix}$ D) $\begin{bmatrix}1\\1\\6\\15\end{bmatrix}$	1
2.	$If\ A=\{a_{ij}\}$ is a square matrix of order 2 such that $a_{ij}=\begin{cases}1, when\ i\neq j\\0, when\ i=j\end{cases}$, $A)\ \begin{pmatrix}1&0\\1&0\end{pmatrix}$ B) $\begin{pmatrix}1&1\\0&0\end{pmatrix}$ C) $\begin{pmatrix}0&1\\1&0\end{pmatrix}$ D) $\begin{pmatrix}1&0\\0&1\end{pmatrix}$	1
3.	Let A be a skew symmetric matrix of order 3. If |A|=x, then $(2023)^x$ is A) 2023 B) 1/2023 C) 2023^2 D) 1	1
4.	If a matrix A = [1 2 3], then the matrix AA^T is : A) 14 B) $\begin{bmatrix}1&0&0\\0&2&0\\0&0&3\end{bmatrix}$ C) $\begin{bmatrix}1&2&3\\2&3&1\\3&1&2\end{bmatrix}$ D)[14]	1
5.	A and B are two matrices of order 3x2 and 3x2 then the order of the matrix AB^t. A) 3x3 B) 2x2 C) 2x3 D) Not define	1
6.	If for a square matrix A, $A^2-3A+I=O\ and\ A^{-1}=xA+yI$, then the value of x+y is : A) -2 B) 2 C) 3 D) -3	1
7.	If $A=\begin{bmatrix}0&1\\0&0\end{bmatrix}, then\ A^{2023}$ is equal to A) $\begin{bmatrix}0&1\\0&0\end{bmatrix}$ B) $\begin{bmatrix}0&2023\\0&0\end{bmatrix}$ C) $\begin{bmatrix}0&0\\0&0\end{bmatrix}$ D) $\begin{bmatrix}2023&0\\0&2023\end{bmatrix}$	1
8.	Number of symmetric matrices of order 3x3 with each entry 1or-1 is A) 256 B) 64 C) 512 D) 4	1
9.	If $\begin{bmatrix}1&2&1\\2&3&1\\3&a&1\end{bmatrix}$ is a non singular matrix $a\in A$, then the set A is A) R B) {0} C) {4} D) R-{4}	1
10.	If $\begin{bmatrix}2&0\\5&4\end{bmatrix}=P+Q$, where P is a symmetric and Q is a skew symmetric matrix, then Q is equal to A) $\begin{bmatrix}2&5/2\\5/2&4\end{bmatrix}$ B) $\begin{bmatrix}0&-5/2\\5/2&0\end{bmatrix}$ C) $\begin{bmatrix}0&5/2\\-5/2&0\end{bmatrix}$ D) $\begin{bmatrix}2&-5/2\\5/2&4\end{bmatrix}$	1
11.	If O(A)=2×3, O(B)=3×2, O(C)= 3×3 then which of the following is not defined? i)CB+A' ii)C(A+B')' iii)BAC iv)C(A+B')	1

12.	If A= $\begin{bmatrix}1 & 2 & 3\\1 & 4 & 9\\1 & 8 & 27\end{bmatrix}$ what is the value of |adjA|? i)36 ii)72 iii)144 iv) none	1
13.	The matrix A has x rows and (x+5) columns and matrix B has y rows and (11-y) column. Both AB and BA exist then the value of x and y are- i) 8,3 ii)3,4 iii)3,8 iv)8,8	1
14.	If the matrix $\begin{bmatrix}1 & 3 & a+2\\2 & 4 & 8\\3 & 5 & 10\end{bmatrix}$ is singular then what is the value of a? i)-2 ii) 4 iii) 2 iv) -4	1
15.	If I is a unit matrix of order 10 then the determinant of I is equal to _____. i)10 ii)1 iii)1/10 iv)9	1
16.	What is the total number of possible matrices of order 3x3 with each entry 2 and 0 ? i)9 ii)27 iii)81 iv)512	1
17.	If A=$\begin{bmatrix}0 & 2\\3 & -4\end{bmatrix}$ and kA = $\begin{bmatrix}0 & 3a\\2b & 24\end{bmatrix}$, then the value of k ,a, b are respectively i)-6, -12, -18 ii)-6,4,9 iii)-6, -4, -9 iv)-6,12,18	1
18.	If A=$\begin{bmatrix}4 & x+2\\2x-3 & x+2\end{bmatrix}$ is a symmetric matrix , then x= i)3 ii)2 iii)4 iv)5	1
19.	if A is a square matrix of order 4 and I is unit matrix then which of the following is true? i)det(2A) = 2detA ii) det(-A) = -det A iii)det(A+I) = det A+I iv)det(2A)= 16det(A)	1
20.	If A is a non-singular matrix satisfying A^2-A+2I=0, then A^{-1}= i)I-A ii) $\frac{1}{2}(I-A)$ iii)I+A iv)$\frac{1}{2}$(I+A)	1
21.	If the order of matrix A is m × p. And the order of B is p × n. Then the order of matrix AB is? (a) n × p (b) m × n (c) n × p (d) n × m	1
22.	If a matrix has 6 elements, then number of possible orders of the matrix can be (a) 2 (b) 4 (c) 3 (d) 6	1

23.	If A = diag (3, -1), then matrix A is (a) $\begin{bmatrix} 0 & 3 \\ 2 & -1 \end{bmatrix}$ (b) $\begin{bmatrix} 2 & -1 \\ 3 & 0 \end{bmatrix}$ (c) $\begin{bmatrix} 3 & 0 \\ 0 & -1 \end{bmatrix}$ (d) $\begin{bmatrix} 3 & -1 \\ 0 & -2 \end{bmatrix}$	1
24.	If A = $[a_{ij}]$ is a 2 × 3 matrix, such that $a_{ij} = \frac{(-i+2j)^2}{5}$ then a_{23} is (a) $\frac{1}{5}$ (b) $\frac{2}{5}$ (c) $\frac{9}{5}$ (d) $\frac{16}{5}$	1
25.	If A = diag. [5, -2, 7] ; B = diag. [7, 8, 5], then $3A - 2B =$ (a) diag. [1, -22, -11] (c) diag. [-1, 22, -11] (b) diag. [-1, -22, 11] (d) diag. [1, -22, 11]	1
26.	If A is a symmetric matrix of integers with zeroes on the main diagonal, the sum of the entries of A must be an ____. a. integer b. odd integer c. even integer d. irrational number	1
27.	If X is any m × n matrix such that XY and YX both defined, then Y is an ____. a. m × n matrix b. n × m matrix c. n × n matrix d. m × m matrix	1
28.	If A is a square matrix of order p and if there exists another square matrix B of the same order p, such that AB = BA = I, then _____. a. A^{-1} does not exist b. AB is defined c. B is called the inverse matrix of A d. A is not the inverse of B	1
29.	The total number of elements in a matrix represents a prime number. The possible orders the matrix can have _____. a. 2 b. 9 c. 1 d. 4	1
30.	**Assertion (A)**: If A = $\begin{bmatrix} 0 & 2 & -1 \\ -2 & 0 & 3 \\ 1 & -3 & 0 \end{bmatrix}$ then, A^{-1} is a skew symmetric matrix. **Reason(R):** If A is skew symmetric matrix then A^{-1} is skew symmetric matrix. (a) Both A and R are true and R is the correct explanation of A (b) both A and R are true but R is not correct explanation of A (c) A is true but R is false (d) A is false but R is true	1
31.	Let A, B, C are three matrices of same order.	1

	Now, consider the following statements: Assertion (A): If A = B, then AC = BC Reason (R): If AC = BC, then A = B (a) Both A and R are true and R is the correct explanation of A. (b) Both A and R are true but R is not the correct explanation of A. (c) A is true but R is false. (d) A is false but R is true.	
32.	A is square matrix of order 3 and |A| = 7. Write the value of |adj. A|.	1
33.	A matrix has 5 elements, write all possible order it can have.	1
34.	Total number of possible matrices of order 2 × 3 with each entry 1 or 0 is. (a) 6 b) 36 c) 32 d) 64	1
35.	Assume Y, W and P, are the matrices of order 3×k, n×3 and p×k. Find the restrictions on n, k and p, so that PY+WY will be defined.	1
36.	If A is a square matrix such that A^2=A, then (I + A)^2 – 3A is (a) I (b) 2A (c) 3I (d) A	1
37.	If A and B are two matrices such that AB = B and BA = A, then B^2 is equal to a) B b) A c) 1 d) 0	1
38.	Construct a 3x1 matrix A =[aij] whose elements aij are given by aij=$\frac{1}{2}$ |-3i-j|	1
39.	If A, B are symmetric matrices of same order, then AB – BA is a (A) Skew symmetric matrix (B) Symmetric matrix (C) Zero matrix (D) Identity matrix	1
40.	If A= $\begin{bmatrix} cosa & -sinb \\ sinb & cosa \end{bmatrix}$, then A+A'= I, if the value of a is: a) $\frac{\Pi}{6}$ b) $\frac{\Pi}{3}$ c) Π d) $\frac{3\Pi}{2}$	1
41.	The matrix $\begin{bmatrix} 2 & -1 & 4 \\ 1 & 0 & -5 \\ -4 & 5 & 7 \end{bmatrix}$ is A) A symmetric matrix B) A skew symmetric matrix C) A diagonal matrix None of these	1
42.	A matrix has 18 elements, then possible number of orders of a matrix are A) 3	1

	B) 4 C) 6 D) 5	
43.	If matrix A is of order m ×n, and for matrix B, AB and BA both are defined, then order of matrix B is A) m ×n B) n ×n C) m ×n D) n ×m	1
44.	The diagonal elements of a skew symmetric matrix are A) all zeros B) are all equal to some scalar k($\neq 0$) C) can be any number D) none of these	1
45.	If $\begin{pmatrix} y+2x & 5 \\ -x & 3 \end{pmatrix}=\begin{pmatrix} 7 & 5 \\ -2 & 3 \end{pmatrix}$, then the value of y is A) 11 B) 3 C) -3 D) 1	1
46.	Total no of possible matrices of order 3×3 with each entry 1 or 0 is A) 512 B) 64 C) 32 D) 36	1
47.	If matrix A= $[1 \quad 2 \quad 3]$ then A$A^t equal\ to$, where A^t Is the transpose of matrix A. A) $[14]$ B) $[12]$ C) 0 $[10]$	1
48.	If A= $\begin{bmatrix} 0 & a \\ 0 & 0 \end{bmatrix}$ then A^{16} is equal to A) A B) $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ C) $\begin{pmatrix} 1 & 0 \\ 1 & 0 \end{pmatrix}$ $[12]$	1
49.	If A and B are symmetric matrices, then AB-BA is a A) Symmetric matrix B) Skew symmetric matrix	1

	C) Diagonal matrix Unit matrix	
50.	If A is a square matrix such that A^2=A, then $(I+A)^2-3A$ *is* A) I B) 2I C) 3I D) A	1
51.	If A and B are symmetric matrices, then ABA is a) symmetric matrix b) diagonal matrix c) skew - symmetric matrix d) scalar matrix	1
52.	If A = $\begin{bmatrix} 2 & 0 & -3 \\ 4 & 3 & 1 \\ -5 & 7 & 2 \end{bmatrix}$ is expressed as the sum of a symmetric and skew - symmetric matrix, then the symmetric matrix is a) $\begin{bmatrix} 2 & 2 & -4 \\ 2 & 3 & 4 \\ -4 & 4 & 2 \end{bmatrix}$ b) $\begin{bmatrix} 2 & 4 & -5 \\ 0 & 3 & 7 \\ -3 & 1 & 2 \end{bmatrix}$ c) $\begin{bmatrix} 4 & 4 & -8 \\ 4 & 6 & 8 \\ -8 & 8 & 4 \end{bmatrix}$ d) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$	1
53.	If$A = \begin{bmatrix} 0 & 2 & -3 \\ -2 & 0 & -1 \\ 3 & 1 & 0 \end{bmatrix}$ then A is a a) skew - symmetric matrix b) symmetric matrix c) none of these d) diagonal matrix	1
54.	The number of all possible matrices of order3×3 with each entry 0 or1 is a) 81 b) none of these c) 512 d) 18	1
55.	If A = $\begin{bmatrix} 1 & 2 & x \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ and B = $\begin{bmatrix} 1 & -2 & y \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ and AB = I_3 , then x + y equals a) - 1 b) 0 c) none of these d) 2	1
56.	A = $[a_{ij}]_{m \times n}$ is a square matrix, if a) m < n	1

	b) m > n c) m = n d) None of these	
57.	If A = $\begin{bmatrix}1 & -1\\2 & -1\end{bmatrix}$, B = $\begin{bmatrix}a & 1\\b & -1\end{bmatrix}$ and $(A + B)^2 = A^2 + B^2$, then values of a and b are a) a = 0, b = 4 b) a = 1, b = 4 c) a = 2, b = 4 d) a = 4, b = 1	1
58.	If A = $\begin{bmatrix}0 & 1\\1 & 0\end{bmatrix}$, then A^2 is equal to a) $\begin{bmatrix}0 & 1\\0 & 1\end{bmatrix}$ b) $\begin{bmatrix}0 & 1\\1 & 0\end{bmatrix}$ c) $\begin{bmatrix}1 & 0\\1 & 0\end{bmatrix}$ d) $\begin{bmatrix}1 & 0\\0 & 1\end{bmatrix}$	1
59.	If A and B are matrices of same order, then (AB' – BA') is a a) null matrix b) unit matrix c) symmetric matrix d) skew - symmetric matrix	1
60.	If A and B are two matrices of the order 3× m and 3 × n, respectively, and m = n, then the order of matrix (5A – 2B) is a) 3× 3 b) m× n c) 3× n d) m× 3	1
61.	If a matrix has 8 elements then the total number of different orders of writing the matrices is a) 1 b) 2 c) 3 d) 4	1
62.	If A = $\begin{bmatrix}1 & 1\\1 & 1\end{bmatrix}$ and nϵN, then A^n is equal to a. n A b. 2n A c. 2^{n-1} A d. 2^n A	1
63.	$A = [a_{ij}]_{mxn}$ is a square matrix, if a. m < n b. m > n c. m = n d. none of these	1
64.	The number of all possible matrices of order 3x3 with each entry 0 or 1 is: a. 27	1

	b. 18 c. 81 d. 512	
65.	If A = $\begin{bmatrix}1 & 0\\2 & 1\end{bmatrix}$, B = $\begin{bmatrix}x & 0\\1 & 1\end{bmatrix}$ and A = B^2, then x equals a. -1 b. 1 c. 2 d. -2	1
66.	If A is a square matrix and $A^2 = A$, then $(I + A)^2 - 3A$ is equal to: a. I b. A c. 2A d. 3I	1
67.	The numbers of all possible matrices of order 2x2 with each entry 1, 2 or 3 is a. 12 b. 64 c. 81 d. 7	1
68.	If A and B are square matrices of same order , then $AB' - BA'$ is a a. skew – symmetric matrix b. symmetric matrix c. null matrix d. unit matrix	1
69.	If A is a square matrix such that $A^2 = A$, then find $(2 + A)^3 - 19$ A. a. 8I b. 2I c. I d. A	1
70.	If the matrix A is both symmetric and skew symmetric matrix, then a. A is a diagonal matrix b. A is a zero matrix c. A is a square matrix d. none of these	1
71.	Radha has 3 notebooks and 2 pens, Krishna has 2 notebooks and 1 pen and Ram has 4 notebooks and 2 pens. A matrix is formed with the number of notebooks and pen that the three persons have in three rows and three columns. The number of elements in the matrix is (a) 14 (b) 6 (c) 2 (d) 8	1
72.	If 5 students have pens only, then a matrix with only one column is created which lead to the idea of a type of matrix. This matrix is known as (a) Row matrix (b) column matrix (c) square matrix (d) diagonal matrix	1
73.	Given that matrices A and B are of order 3 x n and m x 5 respectively, then the order of the matrix C = 5A + 3B is (a) 3 x 5 (b) 5 x 3 (c) 3 x 3 (d) 5 x 5	1
74.	Sudha created a square matrix A such that $A^2 = A$, the $(I + A)^3 - 7A$ is equal to (a) A (b) I + A (c) I – A (d) I	1

75.	Given that A = $\begin{bmatrix} a & b \\ c & -c \end{bmatrix}$ and $A^2 = 3I$, then (a) $1 + a^2 + bc = 0$ (b) $1 - a^2 - bc = 0$ (c) $3 - a^2 - bc = 0$ (d) $3 + a^2 + bc = 0$	1
76.	Neha has a factory which produces shoes for boys and girls in three different price categories labelled 1, 2 and 3. The quantity produced by the factory is represented by the matrix given below Boys Girls 1 2 3 $\begin{bmatrix} 80 & 40 \\ 65 & 70 \\ 50 & 75 \end{bmatrix}$. Now if the production in the factory is doubled in all categories then the revised quantities produced by the factory is given by the matrix (a) $\begin{bmatrix} 160 & 80 \\ 65 & 70 \\ 50 & 75 \end{bmatrix}$ (b) $\begin{bmatrix} 80 & 40 \\ 130 & 140 \\ 50 & 75 \end{bmatrix}$ (c) $\begin{bmatrix} 80 & 40 \\ 65 & 70 \\ 50 & 75 \end{bmatrix}$ (d) $\begin{bmatrix} 160 & 80 \\ 130 & 140 \\ 100 & 150 \end{bmatrix}$	1
77.	For a matrix A = $\begin{bmatrix} 2 & 5 \\ -11 & 7 \end{bmatrix}$, the value of AI is (a) $\begin{bmatrix} -2 & -5 \\ 11 & -7 \end{bmatrix}$ (b) $\begin{bmatrix} 2 & 5 \\ -11 & 7 \end{bmatrix}$ (c) $\begin{bmatrix} 7 & 11 \\ -5 & 2 \end{bmatrix}$ (d) $\begin{bmatrix} 7 & -5 \\ 11 & 2 \end{bmatrix}$	1
78.	There are 3 families A, B and C. The number of men, women and children in these families are as under: When the above table is represented by a matrix , the order of the matrix is (a) 3 x 1 (b) 1 x 3 (c) 3 x 2 (d) 3 x 3	1
79.	If A = $\begin{bmatrix} 0 & 2 \\ 3 & -4 \end{bmatrix}$ and kA = $\begin{bmatrix} 0 & 3a \\ 2b & 24 \end{bmatrix}$ then the value of k, a and b respectively are (a) -6, -12, -18 (b) -6, -4, - 9 (c) -6, 4, 9 (d) -6, 12. 18	1
80.	The number of all possible matrices of order 3 x 2 with entry 0 or 1 is (a) 18 (b) 27 (c) 64 (d) 512	1

	Men	Women	Children
Family A	2	3	1
Family B	2	1	3
Family C	4	2	6

ANSWERS:

Q. NO	ANSWER	MARKS
1.	B	1
2.	C	1
3.	D	1
4.	D	1
5.	A	1
6.	B	1
7.	C	1
8.	C	1
9.	D	1
10.	B	1
11.	(iv)C(A+B') Ans- O(B') =2X3 O(A+B')=2X3 C(A+B') is not defined as number of column of C ≠ number of rows in A+B'	1
12.	(iii)144 Ans- det(A)=12 Det(adjA) =det(A)$^{3-1}$ =12^2 =144 properties:- det(adjA)=det(A)$^{n-1}$	1
13.	iii)3,8 ans:- AB exist if x+5=y BA exist if 11-y=x Solving these two equation : x=3 and y=8	1
14.	ii)4 ans:-if the determinant of a matrix is zero then the matrix is called singular. Thus, det(A)=0 i.e 2a-8=0 i.e a=4	1
15.	ii)1 ans:- determinant of a unit matrix of any order is 1.	1
16.	iv)512 ans:-in a 3x3 order matrix total number of entry is 9. Each entry is done by either 2 or 0 i.e by 2ways.so, by fundamental principle of counting the total number of ways in which 9elements can be chosen to form matrices is 2^9=512 .	1
17.	iii)-6, -4, -9 ans:- kA=$k\begin{bmatrix}0 & 2\\3 & -4\end{bmatrix}=\begin{bmatrix}k & 2k\\3k & -4k\end{bmatrix}=\begin{bmatrix}0 & 3a\\2b & 24\end{bmatrix}$ by equality of matrices -4k=24 i.e k=-6 3a=2k i.e a=-4 2b=3k i.e b=-9	1
18.	iv)5 ans:- for a symmetric matrix A=A^T x+2= 2x-3 x=5	1
19.	iv)det(2A) = 16(detA) ans:- $\lvert kA\rvert = k^n\lvert A\rvert$ where A is matrix of order n	1

20.	ii)$\frac{1}{2}(I-A)$ ans:-A is non-singular matrix so A^{-1} exist multiply A^{-1} in both side of matrix equation and use $A^{-1}A=I$ and $A^{-1}I=A^{-1}$	1
21.	b	1
22.	b	1
23.	c	1
24.	d	1
25.	d	1
26.	c	1
27.	b	1
28.	c	1
29.	a	1
30.	a	1
31.	C	1
32.	49	1
33.	5×1 or 1×5	1
34.	D	1
35.	K=3 and p=n	1
36.	A	1
37.	A	1
38.	$A=\begin{bmatrix} 2 \\ 7/2 \\ 5 \end{bmatrix}$	1
39.	A	1
40.	B	1
41.	D	1
42.	C	1
43.	D	1
44.	A	1
45.	B	1
46.	A	1
47.	A	1
48.	B	1
49.	B	1
50.	A	1
51.	(a)	1
52.	(a)	1
53.	(a)	1
54.	(c)	1
55.	(b)	1
56.	(a)	1
57.	(b)	1

58.	(d)	1
59.	(d)	1
60.	(c)	1
61.	d	1
62.	d	1
63.	c	1
64.	d	1
65.	b	1
66.	c	1
67.	c	1
68.	a	1
69.	a	1
70.	b	1
71.	b	1
72.	b	1
73.	a	1
74.	d	1
75.	c	1
76.	d	1
77.	b	1
78.	d	1
79.	b	1
80.	C	1

CHAPTER-3

MATRICES

02 MARK TYPE QUESTIONS

<table>
<tr><th>Q. NO</th><th>QUESTION</th><th>MARK</th></tr>
<tr><td>1.</td><td>Gautam buys 5 pens, 3 bags and 1 instrument box and pays a sum of Rs.160. From the shop, Vikram buys 2 pens, 1 bag and 3 instrument boxes and pays a sum of Rs.190. Also Ankur buys 1 pen, 2 bags and 4 instrument boxes and pays a sum of Rs.250.
Represent the above information in matrix equation.</td><td>2</td></tr>
<tr><td>2.</td><td>Consider two families A and B. Suppose there are 4 men, 4 women and 4 children in family A and 2 men, 2 women and 2 children in family B. The recommended daily amount of calories is 2400 for a man, 1900 for a woman 1800 for a children and 45 grams of proteins for a man, 55 grams for a woman and 33 grams for children.
What are requirement of calories of family A is:</td><td>2</td></tr>
<tr><td>3.</td><td>If $A = (a_{ij})_{mxn}$ and $B = (b_{ij})_{mxn}$ are two matrices , then $A \pm B$ is of order mxn is defined as $(A \pm B)_{ij} = a_{ij} \pm b_{ij}$, where i=1,2,3….m, j = 1,2,3…n. $A = (a_{ij})_{mxn}$ and $b = (b_{jk})_{nxp}$ are two matrices, then AB is of order mxp and is defined as $(AB)_{ixk} = \sum_{r=1}^{n} a_{ir}b_{rk} =$
$a_{i1}b_{1k} + a_{i2}b_{2k} + \cdots \ldots \ldots . + a_{im}b_{mk}$
Consider A = $\begin{bmatrix} 2 & -1 \\ 3 & 4 \end{bmatrix}$ and B=$\begin{bmatrix} 5 & 2 \\ 7 & 4 \end{bmatrix}$, $C = \begin{bmatrix} 2 & 5 \\ 3 & 8 \end{bmatrix}$, $D = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$
Find the matrix D such that AB-CD=0</td><td>2</td></tr>
<tr><td>4.</td><td>Two farmers Shyam and Balwan singh cultivated only three varieties of pulses namely Urad, Masoor and Mung. The sales of these varieties of pulses by both the farmers in the month of September and October are given by the following matrices A and B.
September sales in Rupees:
$A = \begin{bmatrix} 10000 & 20000 & 30000 \\ 50000 & 30000 & 10000 \end{bmatrix}$
October sales in rupees
$B = \begin{bmatrix} 5000 & 10000 & 6000 \\ 20000 & 10000 & 10000 \end{bmatrix}$
1 What is the combined sales of Masoor in September and October for Balwar Singh.</td><td>2</td></tr>
<tr><td>5.</td><td>A bolt manufacturing company produces three types of bolts x, y and z which he sell in two markets. Annual sales are indicated in the following table:
<table>
<tr><td rowspan="2">Market</td><td colspan="3">Products (in numbers)</td></tr>
<tr><td>X</td><td>Y</td><td>z</td></tr>
<tr><td>I</td><td>5000</td><td>1000</td><td>9000</td></tr>
<tr><td>II</td><td>3000</td><td>10000</td><td>4000</td></tr>
</table>
If unit sales price x, y and z are Rs.2.50, Rs.1.50 and Rs.1 respectively, then answer the following.
Total revenue collected from market I and II.</td><td>2</td></tr>
<tr><td>6.</td><td>If A = $\begin{bmatrix} ab & b^2 \\ -a^2 & -ab \end{bmatrix}$ and A^n= 0 then find minimum value of n?

i)2 ii) 3 iii) 4 iv)5</td><td>2</td></tr>
<tr><td>7.</td><td>If A =$\begin{bmatrix} 4 & 2 \\ -1 & 1 \end{bmatrix}$ and I is the identity matrix of order 2 then (A-2I) (A-3I) =

i)1 ii) zero matrix iii) Identity matrix iv) 0</td><td>2</td></tr>
</table>

8.	For what value of p, $A^2 = 0$, where A= $\begin{bmatrix} p & 1 \\ -1 & -p \end{bmatrix}$ i)0 ii) ∓ 1 iii) -1 iv) 1	2
9.	If A = $\begin{bmatrix} 1 & \tan\frac{\theta}{2} \\ -\tan\frac{\theta}{2} & 1 \end{bmatrix}$ and AB = I then B= i)$\cos^2\frac{\theta}{2}$ A ii) $\cos^2\frac{\theta}{2}$ I iii) $\cos^2\frac{\theta}{2}A^T$ iv) none	2
10.	If α and β are the roots of the equation $1+x+x^2=0$, then $\begin{bmatrix} 1 & \beta \\ \alpha & \alpha \end{bmatrix}\begin{bmatrix} \alpha & \beta \\ 1 & \beta \end{bmatrix}$= i)$\begin{bmatrix} 1 & 1 \\ 1 & 2 \end{bmatrix}$ ii)$\begin{bmatrix} -1 & -1 \\ -1 & 2 \end{bmatrix}$ iii)$\begin{bmatrix} 1 & -1 \\ -1 & 2 \end{bmatrix}$ iv)$\begin{bmatrix} -1 & -1 \\ -1 & -2 \end{bmatrix}$	2
11.	If A is a square matrix such that $A^2 = I$, then find the simplified value of $(A - I)^3 + (A + I)^3 - 7A$.	2
12.	Write the number of all possible matrices of order 2 × 2 with each entry 1, 2 or 3.	2
13.	$If\ 2\begin{bmatrix} 1 & 3 \\ 0 & x \end{bmatrix}+\begin{bmatrix} y & 0 \\ 1 & 2 \end{bmatrix}=\begin{bmatrix} 5 & 6 \\ 1 & 8 \end{bmatrix}$ then, find the value if x+ y.	2
14.	If $A=\begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{bmatrix}$ then find value of $A^2 - 3A + 2I$.	2
15.	If $A=\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & x \\ -2 & 2 & -1 \end{bmatrix}$ is a matric satisfying $AA^T = 9I_3$, find x.	2
16.	Two schools A and B want to award their selected students on the values of Honesty, Hard work and Punctuality. The school A wants to award Rs. x each, Rs. y each and Rs. z each for the three respective values to its 3, 2 and 1 students respectively with a total award money of Rs.2200. School B wants to spend Rs.3100 to award its 4, 1 and 3 students on the respective values. The total amount of award for one prize on each value is Rs.1200. Convert this problem in matrix form.	2
17.	If A = $(a_{ij}) = \begin{bmatrix} 2 & 3 & -5 \\ 1 & 4 & 9 \\ 0 & 7 & -2 \end{bmatrix}$ and B = $(b_{ij}) = \begin{bmatrix} 2 & 1 & -1 \\ -3 & 4 & 4 \\ 1 & 5 & 2 \end{bmatrix}$, then (find co factor of a_{22}) + (co factor of b_{21})	2
18.	If A and B are symmetric matrices of the same order, prove that AB + BA is symmetric.	2
19.	If A is a square matrix such that $A^2 = A$, then write the value of $7A-(I + A)^3$, where I is the identity matrix	2

20.	If $A = \begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$, Write A^{-1}in terms of A	2
21.	If A and B are symmetric matrices, show that AB is symmetric ,if AB=BA.	2 MARKS
22.	If A=$\begin{pmatrix} 1 & 4 & 7 \\ 2 & 5 & 8 \\ 3 & 6 & 9 \end{pmatrix}$ write $a_{33}+a_{12}$=	2
23.	Show that A=$\begin{bmatrix} 0 & -1 & 2 \\ 1 & 0 & 3 \\ -2 & -3 & 0 \end{bmatrix}$is a skew symmetric matrix.	2
24.	If the matrix A=$\begin{bmatrix} 0 & a & -3 \\ 2 & 0 & -1 \\ b & 1 & 0 \end{bmatrix}$ is skew symmetric matrix. Find the values of a and b.	2 MARKS
25.	If $\begin{pmatrix} 2 & 3 \\ 5 & 7 \end{pmatrix}\begin{pmatrix} 1 & -3 \\ -2 & 4 \end{pmatrix} = \begin{pmatrix} -4 & 6 \\ -9 & x \end{pmatrix}, find\ the\ value\ of\ x.$	2
26.	Let A =$\begin{bmatrix} 1 & -1 & 0 \\ 2 & 1 & 3 \\ 1 & 2 & 1 \end{bmatrix}$ and B = $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 3 \\ 0 & 1 & 1 \end{bmatrix}$. Find A ′ , B ′ and verify that(2A)'=2A '	2
27.	Let A =$\begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix}$, B = $\begin{bmatrix} 4 & 0 \\ 1 & 5 \end{bmatrix}$, C = $\begin{bmatrix} 2 & 0 \\ 1 & -2 \end{bmatrix}$ Show thatA (BC) = (AB) C	2
28.	For what values of x: $\begin{bmatrix} 1 & 2 & 1 \end{bmatrix}\begin{bmatrix} 1 & 2 & 0 \\ 2 & 0 & 1 \\ 1 & 0 & 2 \end{bmatrix}\begin{bmatrix} 0 \\ 2 \\ x \end{bmatrix}$ = 0.	2
29.	Let A =$\begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix}$, B = $\begin{bmatrix} 4 & 0 \\ 1 & 5 \end{bmatrix}$, C = $\begin{bmatrix} 2 & 0 \\ 1 & -2 \end{bmatrix}$ Show that (AB) ′ = B ′ A ′	2
30.	There are 3 families A, B and C. The number of men, women and children in these families are as <table><tr><td></td><td>Men</td><td>Women</td><td>Children</td></tr><tr><td>Family A</td><td>2</td><td>3</td><td>1</td></tr><tr><td>Family B</td><td>2</td><td>1</td><td>3</td></tr><tr><td>Family C</td><td>4</td><td>2</td><td>6</td></tr></table> under: Daily expenses of men, women and children are₹ 200, ₹ 150 and ₹ 200 respectively. Only men and women earn and children do not. Using matrix multiplication, calculate the daily expenses of each family. What impact does more children in the family create on the society ?	2
31.	Find k if A = $\begin{bmatrix} 3 & -2 \\ 4 & -2 \end{bmatrix}$, and I = $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ satisfy the relation $A^2 = k\,A - 2I$.	2
32.	If A = $\begin{bmatrix} sin\alpha & cos\alpha \\ -cos\alpha & sin\alpha \end{bmatrix}$, then verify that A'A = I.	2
33.	If A' = $\begin{bmatrix} -2 & 3 \\ 1 & 2 \end{bmatrix}$ and B = $\begin{bmatrix} -1 & 0 \\ 1 & 2 \end{bmatrix}$, then find (A + 2B)'.	2
34.	If $\begin{bmatrix} 3x-2y & 5 \\ x & -2 \end{bmatrix} = \begin{bmatrix} 3 & 5 \\ -3 & -2 \end{bmatrix}$, find the value of y .	2

35.	If $\begin{bmatrix}1 & 0 & 0\\ 0 & -1 & 0\\ 0 & 0 & 1\end{bmatrix}\begin{bmatrix}x\\ y\\ z\end{bmatrix} = \begin{bmatrix}1\\ 0\\ 1\end{bmatrix}$, find x,y,z.	2
36.	Consider the following information regarding the number of men and women worker in three factories I, II and III Men wokers Women wokers I 20 25 II 15 30 III 40 50 Represent the above information in the form of a 3 x 2 matrix. What does the entry in the second row and second column represent?	2
37.	If A = $[a_{ij}]$ is a square matrix of order 2 such that $a_{ij} = \begin{cases}1, when\ i \neq j\\ 0, when\ i = j\end{cases}$ then find A^2.	2
38.	Explain why in general (i) $(A - B)(A + B) \neq A^2 - B^2$ (ii) $(A + B)^2 \neq A^2 + 2AB + B^2$, where A and B are matrices of same order.	2
39.	There are 3 families A, B and C. The number of men, women and children in these families are as under: Men Women Children Family A 2 3 1 Family B 2 1 3 Family C 4 2 6 Daily expenses of men, women and children are Rs. 200, Rs. 150 and Rs. 200 respectively. Using matrix, calculate the daily expenses of each family.	2
40.	In a legislative assembly election, a political group hired a public relations firm to promote its candidate in three ways: telephone, house calls and letters. The cost per contact (in paise) is given in matrix A as *Cost per contact* $A = \begin{bmatrix}40\\ 100\\ 50\end{bmatrix}\begin{matrix}Telrphone\\ Housecall\\ Letter\end{matrix}$ The number of contacts of each type made in two cities X and Y is given by $B = \begin{bmatrix}1000 & 500 & 5000\\ 3000 & 1000 & 10000\end{bmatrix}\begin{matrix}X\\ Y\end{matrix}$ $Telephone\quad Housecall\quad Letter$ Find the total amount spent by the group in two cities X and Y.	2

ANSWERS:

Q. NO	ANSWER	MARKS
1.	Let $A = \begin{bmatrix} 5 & 3 & 1 \\ 2 & 1 & 3 \\ 1 & 2 & 4 \end{bmatrix}$ and B = $\begin{bmatrix} 160 \\ 190 \\ 250 \end{bmatrix}$ and X = $\begin{bmatrix} x \\ y \\ z \end{bmatrix}$ AX = B	2
2.	24,400	2
3.	AB-CD=0 $D = C^{-1}AB$ Here $C^{-1} = \frac{1}{9}\begin{bmatrix} 4 & -2 \\ -7 & 5 \end{bmatrix}$ and $A.B = \begin{bmatrix} 3 & 0 \\ 43 & 22 \end{bmatrix}$ D = $C^{-1}AB = \frac{1}{9}\begin{bmatrix} -74 & -44 \\ 194 & 110 \end{bmatrix}$	2
4.	$A = \begin{bmatrix} 10000 & 20000 & 30000 \\ 50000 & 30000 & 10000 \end{bmatrix}$ and $B = \begin{bmatrix} 5000 & 10000 & 6000 \\ 20000 & 10000 & 10000 \end{bmatrix}$ A+B = $\begin{bmatrix} 15000 & 30000 & 36000 \\ 70000 & 40000 & 20000 \end{bmatrix}$	2
5.	Rs.23000 and Rs.26500	2
6.	i)2 ANS:- we can find that $A^2=0$ (0 here is zero matrix) $A^3=A^2A=0\cdot A=0$ $A^n=0$ for all n≥2	2
7.	ii)zero matrix ans- (A-2I)(A-3I) =$\begin{bmatrix} 2 & 2 \\ -1 & -1 \end{bmatrix}\begin{bmatrix} 1 & 2 \\ -1 & -2 \end{bmatrix}$ = 0	2
8.	ii)∓ 1 ANS:- $A^2=0$ $P^2-1=0$ $P=\mp 1$	2
9.	iii)$\cos^2\frac{\theta}{2}A^T$ ans:- $\|A\|=1+\tan^2\frac{\theta}{2}$ AB=I ie $B=A^{-1}$ B=(adjA)|A| B=$\begin{bmatrix} 1 & -tan\frac{\theta}{2} \\ tan\frac{\theta}{2} & 1 \end{bmatrix}$/$\sec^2\frac{\theta}{2}$ =$\cos^2\frac{\theta}{2}\cdot A^T$	2
10.	ii)$\begin{bmatrix} -1 & -1 \\ -1 & 2 \end{bmatrix}$ as α and β are roots of $1+x+x^2=0$ $\alpha + \beta = -1$ and $\alpha\beta=1$ Also $1 + \alpha + \alpha^2 = 0$ and $1+\beta + \beta^2 = 0$	2
11.	$A^2 = I$ ……. (i) Now, $(A - I)^3 + (A + I)^3 - 7A$ $= (A^3 - 3A^2I + 3AI^2 - I) + (A^3 + 3A^2I + 3AI^2 + I^3) - 7A$ $= A^3 - 3A^2 + 3AI - I + A^3 + 3A^2 + 3AI + I - 7A$ [$\because A^2I = A^2$ and $I^3 = I^3 = I$] $= 2A^3 + 6AI - 7A = 2A^2 A + 6A - 7A$ [$\because AI = A$] = 2IA – A [from Eq. (1)]	2

	= 2A – A = A [∵ IA = A]	
12.	A matrix of order 2 × 2 has 4 entries. Since, each entry has 3 choices, 1, 2 or 3, therefore number of required matrices $3^4 = 3 \times 3 \times 3 \times 3 = 81$.	2
13.	X=3 , Y = 3 hence X+Y = 6	2
14.	$\begin{bmatrix} 1 & -1 & -1 \\ 3 & -3 & -4 \\ -3 & 2 & 0 \end{bmatrix}$	2
15.	$AA^T = 9I$, $\begin{bmatrix} 9 & 4+2x & 0 \\ 4+2x & 5+x^2 & -2-x \\ 0 & -2-x & 9 \end{bmatrix} = \begin{bmatrix} 9 & 0 & 0 \\ 0 & 9 & 0 \\ 0 & 0 & 9 \end{bmatrix}$ X=-2	2
16.	Let, Award money for value 1 = Rs. X Award money for value 2 = Rs. Y Award money for value 3 = Rs. Z A/Q, For school A: 3X + 2Y + Z = 2200 For school B: 4X + Y + 3Z = 3100 And X + Y + Z = 1200 In matrix form: $\begin{bmatrix} 3 & 2 & 1 \\ 4 & 1 & 3 \\ 1 & 1 & 1 \end{bmatrix} \begin{bmatrix} X \\ Y \\ Z \end{bmatrix} = \begin{bmatrix} 2200 \\ 3100 \\ 1200 \end{bmatrix}$	2
17.	Co factor of a22+ co factor of b21 $= \begin{bmatrix} 2 & -5 \\ 0 & -2 \end{bmatrix} + \begin{bmatrix} 1 & -1 \\ 5 & 2 \end{bmatrix}$ $= \begin{bmatrix} 3 & -6 \\ 5 & 0 \end{bmatrix}$	2
18.	$A^T = A, B^T = B$ $(AB + BA)^T = B^T A^T + A^T B^T$. =BA+AB =AB+BA (Commutativity) Therefore AB+ BA is symmetric.	2
19.	$A^2=A$ $7A-(I+A)^3$ $= 7A-(I^3+A^3+3I^2A+3IA^2)$ $=7A-I-7A$ (Using $I^3=I^2=I$, $A^2=A$) =-I	2
20.	$A=\begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$ Det A= -19 (≠ 0)	2

	Adj A= $\begin{bmatrix} -2 & -3 \\ -5 & 2 \end{bmatrix}$ A^{-1}=Adj A/Det A = 1/19$\begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$ =$\frac{1}{19}$A	
21.	Given A^T=A, B^T=B and if AB is symmetric then $(AB)^T$=AB ALSO $(AB)^T = B^T A^T = BA, therefore\ AB = BA$	2
22.	Here a_{33}=9 and a_{12}=4 therefore $a_{33} + a_{12} = 13$	2
23.	Here A^t=$\begin{pmatrix} 0 & 1 & -2 \\ -1 & 0 & -3 \\ 2 & 3 & 0 \end{pmatrix}$=-$\begin{pmatrix} 0 & -1 & 2 \\ 1 & 0 & 3 \\ -2 & -3 & 0 \end{pmatrix}$=-A Therefore the matrix A is skew symmetric matrix.	2
24.	For skew symmetric matrix, $a_{ij} = -a_{ji}$ this gives $\begin{pmatrix} 0 & a & -3 \\ 2 & 0 & -1 \\ b & 1 & 0 \end{pmatrix} = -\begin{pmatrix} 0 & 2 & b \\ a & 0 & 1 \\ -3 & -1 & 0 \end{pmatrix}$ or a=-2 and b=3.	2
25.	We have $\begin{pmatrix} 2 & 3 \\ 5 & 7 \end{pmatrix}\begin{pmatrix} 1 & -3 \\ -2 & 4 \end{pmatrix} = \begin{pmatrix} -4 & 6 \\ -9 & x \end{pmatrix}$ This gives $\begin{pmatrix} -4 & 6 \\ -9 & 13 \end{pmatrix} = \begin{pmatrix} -4 & 6 \\ -9 & x \end{pmatrix}$ or x=13	2
26.	2 A = 2 $\begin{bmatrix} 1 & -1 & 0 \\ 2 & 1 & 3 \\ 1 & 2 & 1 \end{bmatrix} = \begin{bmatrix} 2 & -2 & 0 \\ 4 & 2 & 6 \\ 2 & 4 & 2 \end{bmatrix}$ (2 A)' = $\begin{bmatrix} 2 & 4 & 2 \\ -2 & 2 & 4 \\ 0 & 6 & 2 \end{bmatrix}$ 2 A' = 2 $\begin{bmatrix} 1 & 2 & 1 \\ -1 & 1 & 2 \\ 0 & 3 & 1 \end{bmatrix} = \begin{bmatrix} 2 & 4 & 2 \\ -2 & 2 & 4 \\ 0 & 6 & 2 \end{bmatrix}$ Hence verified	2
27.	BC = $\begin{bmatrix} 8 & 0 \\ 7 & -10 \end{bmatrix}$ A(BC) = $\begin{bmatrix} 22 & -20 \\ 13 & -30 \end{bmatrix}$ AB = $\begin{bmatrix} 6 & 10 \\ -1 & 15 \end{bmatrix}$ (AB)C = $\begin{bmatrix} 22 & -20 \\ 13 & -30 \end{bmatrix}$ Hence verified	2
28.	$\begin{bmatrix} 1 & 2 & 1 \end{bmatrix}\begin{bmatrix} 1 & 2 & 0 \\ 2 & 0 & 1 \\ 1 & 0 & 2 \end{bmatrix}\begin{bmatrix} 0 \\ 2 \\ x \end{bmatrix}$ = 0. Or, [1+4+1 2+0+0 0+2+2] $\begin{bmatrix} 0 \\ 2 \\ x \end{bmatrix}$ = 0	2

	Or, $[\ 6\ 2\ 2\ ]\begin{bmatrix}0\\2\\x\end{bmatrix} = 0$ Or, $[\ 4 + 4x] = 0$ Or, $4 + 4x = 0$ Or, $x = -1$	
29.	$AB = \begin{bmatrix}6 & 10\\-1 & 15\end{bmatrix}$ $(AB)' = \begin{bmatrix}6 & -1\\10 & 15\end{bmatrix}$ $B'A' = \begin{bmatrix}4 & 1\\5 & 0\end{bmatrix}\begin{bmatrix}1 & -1\\2 & 3\end{bmatrix} = \begin{bmatrix}6 & -1\\10 & 15\end{bmatrix}$ Hence verified	2
30.	The members of three families can be represented by a 3x3 matrix F given below $F = \begin{bmatrix}2 & 3 & 1\\2 & 1 & 3\\4 & 2 & 6\end{bmatrix}$ And the daily expenses of men, women and children can be represented by 3x1 matrix R as given below $R = \begin{bmatrix}200\\150\\200\end{bmatrix}$ The total expense for each of the three families by matrix multiplication FR as given below $FR = \begin{bmatrix}2 & 3 & 1\\2 & 1 & 3\\4 & 2 & 6\end{bmatrix}\begin{bmatrix}200\\150\\200\end{bmatrix} = \begin{bmatrix}1050\\1150\\2300\end{bmatrix}$ Hence, families A, B and C have a daily expense of Rs. 1050, Rs. 1150 and Rs. 2300.	2
31.	**K = 1**	2
32.	Verification	2
33.	$\begin{bmatrix}-4 & 5\\1 & 6\end{bmatrix}$	2
34.	Since corresponding elements of equal matrices are equal. $\therefore$ x= -3 and 3x - 2 y = 3 $\Rightarrow$ y = - 6	2
35.	$\begin{bmatrix}1 & 0 & 0\\0 & -1 & 0\\0 & 0 & 1\end{bmatrix}\begin{bmatrix}x\\y\\z\end{bmatrix} = \begin{bmatrix}1\\0\\1\end{bmatrix} \Rightarrow \begin{bmatrix}x + 0 + 0\\0 - y + 0\\0 + 0 + z\end{bmatrix} = \begin{bmatrix}1\\0\\1\end{bmatrix}$ $\Rightarrow$ x = 1, y = 0, z = 1.	1 1
36.	$\begin{bmatrix}20 & 25\\15 & 30\\40 & 50\end{bmatrix}$ The entry in the second row and second column represent the number of women worker in factory II.	2
37.	$A = \begin{bmatrix}0 & 1\\1 & 0\end{bmatrix}$ $A^2 = \begin{bmatrix}1 & 0\\0 & 1\end{bmatrix}$	2
38.	(A – B)(A + B) = AA + AB – BA – BB	2

	$= A^2 + AB - BA - B^2$ In general $AB \neq BA$ So $(A - B)(A + B) \neq A^2 - B^2$ Similarly, $(A + B)^2 \neq A^2 + 2AB + B^2$	
39.	Let $X = \begin{bmatrix} 2 & 3 & 1 \\ 2 & 1 & 3 \\ 4 & 2 & 6 \end{bmatrix}$ and $Y = \begin{bmatrix} 200 \\ 150 \\ 200 \end{bmatrix}$ $XY = \begin{bmatrix} 400 + 450 + 200 \\ 400 + 150 + 600 \\ 800 + 300 + 1200 \end{bmatrix}$ $= \begin{bmatrix} 1050 \\ 1150 \\ 2300 \end{bmatrix}$ Hence, families A, B and C expense Rs. 1050, Rs. 1150 and Rs. 2300 respectively	2
40.	Here $BA = \begin{bmatrix} 1000 & 500 & 5000 \\ 3000 & 1000 & 10000 \end{bmatrix} \begin{bmatrix} 40 \\ 100 \\ 50 \end{bmatrix}$ $= \begin{bmatrix} 40000 + 50000 + 250000 \\ 120000 + 100000 + 500000 \end{bmatrix}$ $= \begin{bmatrix} 340000 \\ 720000 \end{bmatrix}$ So the total amount spent by the group in cities X and Y are 340000 paise and 720000 paise i.e Rs. 3400 and Rs. 7200 respectively.	2

CHAPTER-3

MATRICES

03 MARK TYPE QUESTIONS

Q. NO	**QUESTION**	**MARK**
1.	A trust fund has Rs.35000 is to be invested in two different types of bonds. The first bond pays 8% interest per annum which will be given to orphanage and second bond pays 10% interest per annum which will be given to an NGO. Use matrix multiplication, determine how to divide Rs.35,000 among two types of bonds if the trust fund obtain an annual total interest of Rs.3200.	3
2.	In a city there are two factories A and B. Each factory produces sports clothes for boys and girls. There are three types of clothes produced in both the factories type I, type II and type III. For boys the number of units of types I, II and III respectively are 80, 70 and 65 in factory A and 85, 64 and 72 are in factory B. For girls the number of units of types I, II and II respectively are 80, 75, 90 in factory A and 50, 55, 80 are in factory B. 1. Write the matrix P, if P represents the matrix of number of units of each type produced by factory A for both boys and girls. 2. Write the matrix Q, if Q represents the matrix of number of units of each type produced by factory B for both boys and girls. 3. Find the total production of sports clothes of each type for boys.	3
3.	The sum of three number is 6. If we multiply third number by 3 and add second number to it, we get 11. By adding first and third number we get double of the second number. The three numbers are respectively - i) 2,3,1 iii)3 ,3,2 ii) 2,1,3 iv)1,2,3	3
4.	If 3x+2Y = I and 2X -Y = 0 where I and 0 are the null matrices of order 3 respectively then :- i) X=1/7 , Y=2/7 ii) X=2/7 ,Y= 1/7 iii) X= (1/7)I , Y = (2/7)I iv) X= (2/7)I , Y = (1/7)I	3
5.	To control a crop disease it is necessary to use 8 units of chemical A ,14 units of chemical B, and 13 units of chemical C. One barrel of spray P contains 1 unit of A, 2units of B and 3 units of C. One unit of spray Q contains 2units of A, 3 units of B and 2 units of C. One barrel of spray R contains 1 unit of A, 2 units of B and 2 units of C . Based on the above information answer the following questions :- (**a**)if x barrels of spray P, y barrels of spray Q and z barrels of spray R are be used to just meet the requirement, then the above information can be represented in the form of : i)x+2y+z=8 2x+3y+2z=14 3x+2y+2z=13 ii) x+2y+3z=8 x+3y+2z=14 x+2y+2z=13 iii) x+2y+z=14 2x+3y+2z=8 3x+2y+2z=13 iv) x+2y+z=13 2x+3y+2z=8 3x+2y+2z=14	3

	  (**b**)if spray P, Q and R cost RS.500, RS.250 and RS.200 per barrel, the total cost incurred is i)1200 ii)1500 iii)950 iv)1600	
6.	If A = $\begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$ satisfies $A^3 - 6A^2 + 7A + kI_3 = 0$, find the value of k	3
7.	If A = $\begin{bmatrix} 3 & 9 \\ 5 & 7 \end{bmatrix}$ is written as A = P + Q, where P is a symmetric matrix and Q is skew-symmetric matrix, then write the matrix P	3
8.	For what value of x, is the matrix A = $\begin{bmatrix} 0 & 1 & -2 \\ -1 & 0 & 3 \\ x & -3 & 0 \end{bmatrix}$ a skew-symmetric matrix?	3
9.	Find the values of x, y, z if the matrix A=. $\begin{bmatrix} 0 & 2y & z \\ x & y-z & \\ x & -y & z \end{bmatrix}$ Satisfy the equation find A^TA = I3	3
10.	If $F(x) = \begin{bmatrix} \cos x & -\sin x & 0 \\ \sin x & \cos x & 0 \\ 0 & 0 & 1 \end{bmatrix}$, Show that $F(x).F(y) = F(x+y)$.	3
11.	If A= $\begin{bmatrix} -2 \\ 4 \\ 5 \end{bmatrix}$ and B=[1 3 -6]Prove that $(AB)^T = B^T A^T$	3
12.	If$\begin{bmatrix} 2x-1 \\ 5 \end{bmatrix} = \begin{bmatrix} 3 \\ x+y \end{bmatrix}$, find x and y.	3
13.	If f(x)=$x^2 - 4x + 1, find\ f(a), when\ a = \begin{pmatrix} 2 & 3 \\ 1 & 2 \end{pmatrix}$	3MARKS
14.	If A=$[-2 \quad -1 \quad -4]$ and B=$\begin{bmatrix} -1 \\ 2 \\ 3 \end{bmatrix}$, Show that $(BA)^T = A^T B^T$.	3
15.	If $\begin{bmatrix} xy & 4 \\ z+6 & x+y \end{bmatrix} = \begin{bmatrix} 8 & w \\ 0 & 6 \end{bmatrix}$, then find values of x, y, z and w.	3

16.	Three persons A, B and C were given the task of creating a square matrix of order 2. Below is the matrix created by them A = $\begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix}$, B = $\begin{bmatrix} 4 & 0 \\ 1 & 5 \end{bmatrix}$ and C = $\begin{bmatrix} 2 & 0 \\ 1 & -2 \end{bmatrix}$ (i) Find the sum of the matrices A, B and C (ii) Evaluate (A')' (iii)Find the matrix AC - BC	3
17.	If A = $\begin{bmatrix} 8 & 0 \\ 4 & -2 \\ 3 & 6 \end{bmatrix}$ and B = $\begin{bmatrix} 2 & -2 \\ 4 & 2 \\ -5 & 1 \end{bmatrix}$, then find the matrix X of order 3 × 2 such that 2A + 3X = 5B.	3
18.	Find A^2 -5A + 6I, if A = $\begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{bmatrix}$	3
19.	If f(x) = $\begin{bmatrix} cosx & -sinx & 0 \\ sinx & cosx & 0 \\ 0 & 0 & 1 \end{bmatrix}$, show that f(x) f(y) = f(x + y).	3
20.	If A^T = $\begin{bmatrix} -2 & 3 \\ 1 & 2 \end{bmatrix}$ and B = $\begin{bmatrix} -1 & 0 \\ 1 & 2 \end{bmatrix}$, find $(A + 2B)^T$.	3
21.	Mahesh created two matrices A = $\begin{bmatrix} -2 & x-y & 5 \\ 1 & 0 & 4 \\ x+y & z & 7 \end{bmatrix}$ and B = $\begin{bmatrix} 0 & a & 3 \\ 2 & b & -1 \\ c & 1 & 0 \end{bmatrix}$. For what values of *x*, *y* and *z* the matrix A is symmetric and for what values of *a*, *b* and *c* the matrix B is skew-symmetric.	3
22.	A teacher gave a problem to his student to express the matrix A = $\begin{bmatrix} 1 & 3 & 5 \\ -6 & 8 & 3 \\ -4 & 6 & 3 \end{bmatrix}$ as the sum of a symmetric and a skew-symmetric matrices. The student gave the answer as A = $\frac{1}{2}\begin{bmatrix} 2 & -3 & 1 \\ -3 & 16 & 9 \\ 1 & 9 & 6 \end{bmatrix} + \frac{1}{2}\begin{bmatrix} 0 & 9 & 9 \\ -9 & 0 & -3 \\ -9 & 3 & 0 \end{bmatrix}$. Examine whether the answer is correct or incorrect.	3
23.	Two matrices are A and B are given as A = $\begin{bmatrix} 3 & -1 & 1 \\ -15 & 6 & -5 \\ 5 & -2 & 2 \end{bmatrix}$, B = $\begin{bmatrix} 2 & 0 & -1 \\ 5 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix}$. Examine whether one is the inverse of the other or not.	3

ANSWERS:

Q. NO	ANSWER	MARKS
1.	Let investment in first type of bond be Rs.x The investment in second type of bond = Rs.35000-x $[x, 35000-x].\begin{bmatrix}\frac{8}{100}\\ \frac{10}{100}\end{bmatrix} = [3200]$ After that will get investment in first bond = Rs.15000 And investment in second bond = Rs.20000	3
2.	1. $P = \begin{bmatrix}80 & 80\\ 70 & 75\\ 65 & 90\end{bmatrix}$ 2. $Q = \begin{bmatrix}85 & 50\\ 65 & 55\\ 72 & 80\end{bmatrix}$ 3. X+Y=[165 135 137]	3
3.	iv) 1,2,3 Ans:- The given problem can be represented as a+b+c = 6 b+3c =11 a-2b+c=0 corresponding matrix equation is $\begin{bmatrix}1 & 1 & 1\\ 0 & 1 & 3\\ 1 & -2 & 1\end{bmatrix}\begin{bmatrix}a\\ b\\ c\end{bmatrix} = \begin{bmatrix}6\\ 11\\ 0\end{bmatrix}$ (AX=B) $\begin{bmatrix}a\\ b\\ c\end{bmatrix} = \frac{1}{9}\begin{bmatrix}7 & -3 & 2\\ 3 & 0 & -3\\ -1 & 3 & 1\end{bmatrix}\begin{bmatrix}6\\ 11\\ 0\end{bmatrix} = \begin{bmatrix}1\\ 2\\ 3\end{bmatrix}$ ($X=A^{-1}B=\frac{Adj\ A}{\lvert A\rvert}B$) So the three numbers are a= 1, b=2, c=3.	3
4.	iii)X=(1/7)I ,Y=(2/7)I ans:- 3X+2Y=I .....(1) 2X-Y=0 4X-2Y=0 .....(2) Solving (1) and (2) 7X=I i.e X=$\frac{1}{7}I$ and Y=$\frac{2}{7}I$	3
5.	(a)(i) x+2y+z=8 2x+3y+2z=14 3x+2y+2z=13 (b)(iv)1600 Ans:- (a)as x,y,z be the number of barrel of spray P, Q, R respectively spray P contains 1 unit of A, 2units of B and 3 units of C spray Q contains 2units of A, 3 units of B and 2 units of C spray R contains 1 unit of A, 2 units of B and 2 units of C . thus option (i) is correct representation (b)solving the liner equation by matrix method AX=B ie $X=BA^{-1}$	3

	$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 8 \\ 14 \\ 13 \end{bmatrix} \begin{bmatrix} 2 & -2 & 1 \\ 2 & -1 & 0 \\ -5 & 4 & -1 \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$ Prices of spray P,Q,R are RS.500 ,RS.250, RS.200 respectively So, the total cost incurred is 1x500+2x250+3x200=1600	
6.	$A^3 - 6A^2 + 7A + kI_3 = 0$ $\begin{bmatrix} -2+k & 0 & 0 \\ 0 & -2+k & 0 \\ 0 & 0 & -2+k \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ K=2	3
7.	$\begin{bmatrix} 3 & 6 \\ 6 & 9 \end{bmatrix}$	3
8.	$A = -A^T$ X=2	3
9.	$A = \begin{bmatrix} 0 & 2y & z \\ x & y & -z \\ x & -y & z \end{bmatrix}$ $A^T = \begin{bmatrix} 0 & x & x \\ 2y & y & -y \\ z & -z & z \end{bmatrix}$ $A^TA = 13$ ⇨ $2x^2 = 1$ ⇨ $x = \pm\frac{1}{\sqrt{2}}$ ⇨ $4y^2 = 1$ ⇨ $y = \pm\frac{1}{2}$ ⇨ $3z^2 = 1$ ⇨ $z = \pm\frac{1}{\sqrt{3}}$	3
10.	$F(x) = \begin{bmatrix} \cos x & -\sin x & 0 \\ \sin x & \cos x & 0 \\ 0 & 0 & 1 \end{bmatrix}.$ $F(y) = \begin{bmatrix} \cos y & -\sin y & 0 \\ \sin y & \cos y & 0 \\ 0 & 0 & 1 \end{bmatrix}.$ $F(x) \times F(y) = \begin{bmatrix} \cos x & -\sin x & 0 \\ \sin x & \cos x & 0 \\ 0 & 0 & 1 \end{bmatrix} \times \begin{bmatrix} \cos y & -\sin y & 0 \\ \sin y & \cos y & 0 \\ 0 & 0 & 1 \end{bmatrix}$ $= \begin{bmatrix} \cos(x+y) & -\sin(x+y) & 0 \\ \sin(x+y) & \cos(x+y) & 0 \\ 0 & 0 & 1 \end{bmatrix}$	3

	= $F(x+y)$	
11.	A= $\begin{bmatrix}-2\\4\\5\end{bmatrix}$ ➔A^T=[-2 4 5] B=[1 3 -6] ➔ B^T=$\begin{bmatrix}1\\3\\-6\end{bmatrix}$ $(AB)^T$=$\begin{bmatrix}-2 & 4 & 5\\-6 & 12 & 15\\12 & -24 & -30\end{bmatrix}$ =B^TA^T	3
12.	Here $\begin{bmatrix}2x-1\\5\end{bmatrix}=\begin{bmatrix}3\\x+y\end{bmatrix}$ this gives 2x-1=3 or 2x=3+1 or 2x =4 or x=2 and x +y=5 or 2+y=5 or y=5-2 or y=3	3
13.	f(x)=x^2-4x+1 therefore f(a)=a^2-4a+1 =$\begin{pmatrix}7 & 12\\4 & 7\end{pmatrix}-4\begin{pmatrix}2 & 3\\1 & 2\end{pmatrix}+$ $\begin{pmatrix}1 & 0\\0 & 1\end{pmatrix}=\begin{pmatrix}0 & 0\\0 & 0\end{pmatrix}=0$	3
14.	A=$[-2 \quad -1 \quad -4]$ and B=$\begin{bmatrix}-1\\2\\3\end{bmatrix}$ this gives $(BA)^T=\begin{bmatrix}2 & 1 & 4\\-4 & -2 & -8\\-6 & -3 & -12\end{bmatrix}^T=$ $\begin{bmatrix}2 & -4 & -6\\1 & -2 & -3\\4 & -8 & -12\end{bmatrix}$ and A^TB^T= $\begin{bmatrix}-2\\-1\\-4\end{bmatrix}[-1\ 2\ 3]=\begin{bmatrix}2 & -4 & -6\\1 & -2 & -3\\4 & -8 & -12\end{bmatrix}$	3
15.	Since, it is given that $\begin{bmatrix}xy & 4\\z+6 & x+y\end{bmatrix}=\begin{bmatrix}8 & w\\0 & 6\end{bmatrix}$ So. xy = 8, w = 4, x + y =6 and z+ 6 = 0 Solving we get x = 2, y = 4, z = - 6, w= 4 Or, x = 4, y = 2, z = - 6, w =4	3
16.	(i) A+B+C = $\begin{bmatrix}1 & 2\\-1 & 3\end{bmatrix}+\begin{bmatrix}4 & 0\\1 & 5\end{bmatrix}+\begin{bmatrix}2 & 0\\1 & -2\end{bmatrix}=\begin{bmatrix}7 & 2\\1 & 6\end{bmatrix}$ (ii) A = $\begin{bmatrix}1 & 2\\-1 & 3\end{bmatrix}$ A' = $\begin{bmatrix}1 & -1\\2 & 3\end{bmatrix}$ (A')' = $\begin{bmatrix}1 & 2\\-1 & 3\end{bmatrix}$ (iii) AC – BC = $\begin{bmatrix}1 & 2\\-1 & 3\end{bmatrix}\begin{bmatrix}2 & 0\\1 & -2\end{bmatrix}-\begin{bmatrix}4 & 0\\1 & 5\end{bmatrix}\begin{bmatrix}2 & 0\\1 & -2\end{bmatrix}$ $=\begin{bmatrix}4 & -4\\1 & -6\end{bmatrix}-\begin{bmatrix}8 & 0\\7 & -10\end{bmatrix}=\begin{bmatrix}-4 & -4\\-6 & 4\end{bmatrix}$	3

17.	Since, $A=\begin{bmatrix}8 & 0\\ 4 & -2\\ 3 & 6\end{bmatrix}$ and $B=\begin{bmatrix}2 & -2\\ 4 & 2\\ -5 & 1\end{bmatrix}$ and $2A+3X=5B$ So, we have $3X=5B-2A$ $=5\begin{bmatrix}2 & -2\\ 4 & 2\\ -5 & 1\end{bmatrix}-2\begin{bmatrix}8 & 0\\ 4 & -2\\ 3 & 6\end{bmatrix}=\begin{bmatrix}-6 & -10\\ 12 & 14\\ -31 & -7\end{bmatrix}$ So, $X=\begin{bmatrix}-2 & -10/3\\ 4 & 14/3\\ -31/3 & -7/3\end{bmatrix}$	3
18.	$\begin{bmatrix}\mathbf{1} & \mathbf{-1} & \mathbf{-3}\\ \mathbf{-1} & \mathbf{-1} & \mathbf{-10}\\ \mathbf{-5} & \mathbf{4} & \mathbf{4}\end{bmatrix}$	3
19.	Verification	3
20.	$A+2B=\begin{bmatrix}-2 & 1\\ 3 & 2\end{bmatrix}+2\begin{bmatrix}-1 & 0\\ 1 & 2\end{bmatrix}=\begin{bmatrix}-4 & 1\\ 5 & 6\end{bmatrix}$ $\therefore \quad (A+2B)^T=\begin{bmatrix}-4 & 5\\ 1 & 6\end{bmatrix}$.	1.5 1.5
21.	A is symmetric if $A=A'$ So $\begin{bmatrix}-2 & x-y & 5\\ 1 & 0 & 4\\ x+y & z & 7\end{bmatrix}=\begin{bmatrix}-2 & 1 & x+y\\ x-y & 0 & z\\ 5 & 4 & 7\end{bmatrix}$ $x-y=1,\ x+y=5,\ z=4$ So $x=3, y=4, z=4$ B is skew symmetric if $B=-B'$ So $\begin{bmatrix}0 & a & 3\\ 2 & b & -1\\ c & 1 & 0\end{bmatrix}=\begin{bmatrix}0 & -2 & -c\\ -a & -b & -1\\ -3 & 1 & 0\end{bmatrix}$ Hence , a = -2, b = 0, c = -3	3
22.	Let $P=\frac{1}{2}\begin{bmatrix}2 & -3 & 1\\ -3 & 16 & 9\\ 1 & 9 & 6\end{bmatrix}$ $P'=\frac{1}{2}\begin{bmatrix}2 & -3 & 1\\ -3 & 16 & 9\\ 1 & 9 & 6\end{bmatrix}$ As $P=P'$, P is symmetric Let $Q=\frac{1}{2}\begin{bmatrix}0 & 9 & 9\\ -9 & 0 & -3\\ -9 & 3 & 0\end{bmatrix}$ $Q'=\frac{1}{2}\begin{bmatrix}0 & -9 & -9\\ 9 & 0 & 3\\ 9 & -3 & 0\end{bmatrix}$ $=-\frac{1}{2}\begin{bmatrix}0 & 9 & 9\\ -9 & 0 & -3\\ -9 & 3 & 0\end{bmatrix}$ $=-Q$ So Q is skew-symmetric $P+Q=\begin{bmatrix}1 & 3 & 5\\ -6 & 8 & 6\\ -4 & 6 & 3\end{bmatrix}$ $=A$ So the answer is correct.	3
23.	Since $AB=BA=I$ So, one is the inverse of the other	3

CHAPTER-3

MATRICES

04 MARK TYPE QUESTIONS

Q. NO	QUESTION	MARK
1.	On her birthday, Seema decided to donate some money to children of an orphanage home. If there were 8 children less, everyone would have ot Rs.10 more. However, if there were 16 children more, everyone would got Rs.10 less. Let the number of children be x and the amount distributed by Seema for one child be y. 1. Find the equation related to the given problem in terms x and y. 2. find the number of children. How much amount is given to each child by seema?	4
2.	Two farmers Ramakishan and Gurucharan singh cultivate only three varieties of rice namely Basmati, Permal and Naura. The sale of these varieties of rice by both the farmers in the month of September and October are given by the following matrices A and B. September sales in Rupees: $A = \begin{bmatrix} 10000 & 20000 & 30000 \\ 50000 & 30000 & 10000 \end{bmatrix}$ October sales in rupees $B = \begin{bmatrix} 5000 & 10000 & 6000 \\ 20000 & 10000 & 10000 \end{bmatrix}$ 1.The total sales in September and October for each farmer in each variety can be represented as A) A+B B) A-B C) A>B D) A<B 2. What is the value of A_{23} ? A) 10,000 B) 20,000 C) 30,000 D) 40,000 3. The decrease in sales from September to October is given by A) A+B B) A-B C) A>B D) A<B 4. If Ramakishan receives 2% profit on gross sales, compute his profit for each variety sold in October. A) Rs.100, Rs.200, Rs.120 B) Rs.100, Rs.200, Rs.130 C) Rs.100, Rs.220, Rs.120 D) Rs.110, Rs.200, Rs.120	4
3.	DIET PROBLEMS :- There are 2 families A and B. There are 4 men, 6 women and 2 children in family A, and 2 men, 2 women 4 children in family B. The recommend daily amount of calories is 2200 for men, 2500 for women, 2000 for children and 75 grams of proteins for men, 70 grams for women and 35 grams for children. Represent the above information using matrix. Using matrix multiplication, calculate the total requirement of calories and proteins for each of the two families. What awareness can you create among people about the planned diet from this question?	4

	 	
4.	HELPING THE DISABLED :- A trust caring for handicapped children gets Rs.30000 every month from its donors. The trust spends half of the funds received for medical & educational care of the children & for that it charges 2% of the spent amount from them, & deposited the balance amount in a private bank to get the money multiplied so that the trust goes on functioning regularly. What percent of interest should the trust get from the bank so as to get a total of Rs. 1800 every month? Use the matrix method to find the rate of interest. 	4
5.	Express the matrix $A = \begin{bmatrix} 2 & 4 & -6 \\ 7 & 3 & 5 \\ 1 & -2 & 4 \end{bmatrix}$ as the sum of a symmetric and skew-symmetric matrix.	4
6.	The sum of three numbers is 2. If we subtract the second number from twice the first number, we get 3. By adding double the second number and the third number we get 0. Represent it algebraically and find the numbers using matrix method.	4
7.	Express the following matrix as the sum of symmetric and a skew-symmetric matrix:	4

	$\begin{bmatrix} 3 & 3 & -1 \\ -2 & -2 & 1 \\ -4 & -5 & 2 \end{bmatrix}$	
8.	If, A=$\begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{bmatrix}$ find $A^2 - 5A + 16I$.	4
9.	Amit, Biju, Chirag are classmates. Each of them was asked to write a square matrix of order 2. They wrote the following matrices. A=$\begin{pmatrix} 1 & 2 \\ -1 & 3 \end{pmatrix}$ B=$\begin{pmatrix} 4 & 0 \\ 1 & 5 \end{pmatrix}$and c=$\begin{pmatrix} 2 & 0 \\ 1 & -2 \end{pmatrix}$.If a=4 and b=-2, based on the above information answer the following question: I) Find the sum of matrices A,B and C II) Find the value of A^T Find AC-BC.	4
10.	Define Lower triangular matrix and upper triangular matrix? give example.	4
11.	If$A = \begin{bmatrix} 0 & -\tan\frac{\alpha}{2} \\ \tan\frac{\alpha}{2} & 0 \end{bmatrix}$ and I is the identity matrix of order 2, show that $I + A = (I - A)\begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$.	4
12.	Find the value of x, if $\begin{bmatrix} 1 & x & 1 \end{bmatrix}\begin{bmatrix} 1 & 3 & 2 \\ 2 & 5 & 1 \\ 15 & 3 & 2 \end{bmatrix}\begin{bmatrix} 1 \\ 2 \\ x \end{bmatrix} = 0$	4
13.	Ram purchases 3 pens, 2 bags, and 1 instrument box and pays ₹ 41. From the same shop, Dheeraj purchases 2 pens, 1 bag, and 2 instrument boxes and pays ₹ 29, while Ankur purchases 2 pens, 2 bags, and 2 instrument boxes and pays ₹ 44.  Read the above information and answer the following questions: (i) Find the cost of one pen. (1 mark) (ii) What are the cost of one pen and one bag? (1 mark) (iii) What is the cost of one pen & one instrument box? (2 marks)	
14.	Three friends Ravi, Raju and Rohit were buying and selling stationery items in a market. The price of per dozen of Pen, notebooks and toys are Rupees x, y and z respectively. Ravi purchases 4 dozen of notebooks and sells 2 dozen pens and 5 dozen toys. Raju purchases 2 dozen toys and sells 3 dozen pens and 1 dozen of notebooks. Rohit purchases one dozen of pens and sells 3 dozen notebooks and one dozen toys. In the process, Ravi, Raju and Rohit earn ₹ 1500, ₹ 100 and ₹400 respectively.	

	 (i) What is the price of one dozen pens? (1 mark) (ii) What is the total price of one dozen pens and one dozen of notebooks? (1 mark) (iii) What is the sale amount of Ravi? (2 marks)	
15.	Three schools DPS, CVC and KVS decided to organize a fair for collecting money for helping the flood victims. They sold handmade fans, mats and plates from recycled material at a cost of Rs. 25, Rs.100 and Rs. 50 each respectively. The numbers of articles sold are given as School /Article DPS CVC KVS Handmade fans 40 25 35 Mats 50 40 50 Plates 20 30 40 Based on the information given above, answer the following questions: (i). What is the total money (in Rupees) collected by the school DPS? (ii). If the number of handmade fans and plates are interchanged for all the schools, then what is the total money collected by all schools? (iii). How many articles (in total) are sold by three schools?	4
16.	There are two families A and B. There are 4 men, 6 women and 2 children in family A and 2 men, 2 women and 4 children in family B. The recommended daily amount of calories is 2400 for men, 1900 for women and 1800 for children 45 grams of protein for men, 55 grams for women and 33 grams for children. (i) Represent the above information using matrices (ii) Calculate the total requirement of calories and proteins for each of the two families.	4

ANSWERS:

<table>
<tr><th>Q. NO</th><th>ANSWER</th><th>MARKS</th></tr>
<tr><td>1.</td><td>1. 5x-4y=40 and 5x-8y=-80
2. x=32 and y =30</td><td>2
2</td></tr>
<tr><td>2.</td><td>1- A 2-A 3-B 4-A</td><td>4</td></tr>
<tr><td>3.</td><td>Ans:-
The given data can be represented as-
Family member:-
<table>
<tr><td></td><td>Men</td><td>women</td><td>Children</td></tr>
<tr><td>A</td><td>4</td><td>6</td><td>2</td></tr>
<tr><td>B</td><td>2</td><td>2</td><td>4</td></tr>
</table>
Diet to in-take:-
<table>
<tr><td></td><td>Calories</td><td>protien</td></tr>
<tr><td>Men</td><td>2200</td><td>75</td></tr>
<tr><td>Women</td><td>2500</td><td>70</td></tr>
<tr><td>children</td><td>2000</td><td>35</td></tr>
</table>
This can be solved in matrix multiplication as
$$\begin{bmatrix}4 & 6 & 2\\ 2 & 2 & 4\end{bmatrix}\begin{bmatrix}2200 & 75\\ 2500 & 70\\ 2000 & 35\end{bmatrix}=\begin{bmatrix}27800 & 790\\ 17400 & 430\end{bmatrix}$$
Thus family A required 27800calories and 790gms of protein ; family B required 17400calories and 430gms of protein.</td><td></td></tr>
<tr><td>4.</td><td>Ans:-
Let us assume that the earning of trust from all the charges is x and earning of trust from the interest obtained from the bank is y.
Total fund received is RS.30000
X= 2% of RS.15000 = 300
As matrix it can be represented as
$$\begin{bmatrix}1 & 1\\ 1 & 0\end{bmatrix}\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}1800\\ 300\end{bmatrix}$$
$$\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}300\\ 1500\end{bmatrix}$$
Let R be the rate of interest by the bank
As y=1500 =$\frac{R}{100}X15000=150$ $i.e.$ R =10%
So, the rate of interest the trust get by the bank is 10%.</td><td>4</td></tr>
<tr><td>5.</td><td>$\frac{1}{2}(A+A')+\frac{1}{2}(A-A')$
$$\begin{bmatrix}2 & \frac{11}{2} & -\frac{5}{2}\\ \frac{11}{2} & 3 & \frac{3}{2}\\ \frac{-5}{2} & \frac{3}{2} & 4\end{bmatrix}+\begin{bmatrix}0 & -\frac{3}{2} & -\frac{7}{2}\\ \frac{3}{2} & 0 & \frac{7}{2}\\ \frac{7}{2} & -\frac{7}{2} & 0\end{bmatrix}=\begin{bmatrix}2 & 4 & -6\\ 7 & 3 & 5\\ 1 & -2 & 4\end{bmatrix}$$</td><td>4</td></tr>
<tr><td>6.</td><td>X+Y+Z=2
2X-Y=3
2Y+2=0</td><td>4</td></tr>
</table>

	x = 1, y = – 2, z = 2	
7.	$A=\begin{bmatrix}3 & 3 & -1\\ -2 & -2 & 1\\ -4 & -5 & 2\end{bmatrix}$ =P+Q $P=\frac{1}{2}\begin{bmatrix}6 & 1 & -5\\ 1 & -4 & -4\\ -5 & -4 & 4\end{bmatrix}$ $Q=-\frac{1}{2}\begin{bmatrix}0 & 5 & 4\\ -5 & 0 & 6\\ 3 & 6 & 0\end{bmatrix}$ Here P is a symmetric matrix and Q is skew symmetric matrix	4
8.	$A=\begin{pmatrix}2 & 0 & 1\\ 2 & 1 & 3\\ 1 & -1 & 0\end{pmatrix}.$ $A^2=\begin{pmatrix}5 & -1 & 2\\ 9 & -2 & 5\\ 0 & -1 & -2\end{pmatrix}.$ $A^2-5A+16I$ $=\begin{pmatrix}5 & -1 & 2\\ 9 & -2 & 5\\ 0 & -1 & -2\end{pmatrix}-5\begin{pmatrix}2 & 0 & 1\\ 2 & 1 & 3\\ 1 & -1 & 0\end{pmatrix}+16\begin{pmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ 0 & 0 & 1\end{pmatrix}$ $=\begin{pmatrix}1 & -1 & -3\\ -1 & -1 & -10\\ -5 & 4 & 4\end{pmatrix}.$	4
9.	A=$\begin{pmatrix}1 & 2\\ -1 & 3\end{pmatrix}$ B=$\begin{pmatrix}4 & 0\\ 1 & 5\end{pmatrix}$and c=$\begin{pmatrix}2 & 0\\ 1 & -2\end{pmatrix}$ A+B+C=$\begin{pmatrix}1 & 2\\ -1 & 3\end{pmatrix}+\begin{pmatrix}4 & 0\\ 1 & 5\end{pmatrix}+\begin{pmatrix}2 & 0\\ 1 & -2\end{pmatrix}=\begin{pmatrix}7 & 2\\ 1 & 6\end{pmatrix}$ $A^T=\begin{pmatrix}1 & -1\\ 2 & 3\end{pmatrix}$ AC-BC=$\begin{pmatrix}4 & -4\\ 1 & -6\end{pmatrix}-\begin{pmatrix}8 & 0\\ 7 & -10\end{pmatrix}=\begin{pmatrix}-4 & -4\\ -6 & 4\end{pmatrix}$	4
10.	A square matrix in which all the elements above the diagonal elements are zero is a lower triangular matrix. Ex: A=$\begin{bmatrix}5 & 0 & 0\\ 1 & -3 & 0\\ 2 & 4 & 2\end{bmatrix}$ A square matrix in which all the elements below the diagonal elements are zero is a upper triangular matrix. Ex: $\begin{bmatrix}5 & 2 & 1\\ 0 & 2 & 3\\ 0 & 0 & 3\end{bmatrix}$	4

11.	L.H.S. = I + A = $\begin{bmatrix}1 & 0\\0 & 1\end{bmatrix} + \begin{bmatrix}0 & -\tan\frac{\alpha}{2}\\ \tan\frac{\alpha}{2} & 0\end{bmatrix} = \begin{bmatrix}1 & -\tan\frac{\alpha}{2}\\ \tan\frac{\alpha}{2} & 1\end{bmatrix}$ I - A = $\begin{bmatrix}1 & 0\\0 & 1\end{bmatrix} - \begin{bmatrix}0 & -\tan\frac{\alpha}{2}\\ \tan\frac{\alpha}{2} & 0\end{bmatrix} = \begin{bmatrix}1 & \tan\frac{\alpha}{2}\\ -\tan\frac{\alpha}{2} & 1\end{bmatrix}$ R.H.S. = $(I-A)\begin{bmatrix}\cos\alpha & -\sin\alpha\\ \sin\alpha & \cos\alpha\end{bmatrix} = \begin{bmatrix}1 & \tan\frac{\alpha}{2}\\ -\tan\frac{\alpha}{2} & 1\end{bmatrix}\begin{bmatrix}\cos\alpha & -\sin\alpha\\ \sin\alpha & \cos\alpha\end{bmatrix}$ $= \begin{bmatrix}1 & -\tan\frac{\alpha}{2}\\ \tan\frac{\alpha}{2} & 1\end{bmatrix}$ Hence, L.H.S. = R.H.S. Verified	4
12.	$\begin{bmatrix}1 & x & 1\end{bmatrix}\begin{bmatrix}1 & 3 & 2\\2 & 5 & 1\\15 & 3 & 2\end{bmatrix}\begin{bmatrix}1\\2\\x\end{bmatrix} = 0$ Or, $\begin{bmatrix}1+2x+15 & 3+5x+3 & 2+x+2\end{bmatrix}\begin{bmatrix}1\\2\\x\end{bmatrix} = 0$ Or, $[x^2+16x+28] = O$ Or, $x^2+16x+28 = 0$ Or, $(x+2)(x+14) = 0$ Or, $x = -2, -14$	4
13.	**(i)** ₹ 2 (ii) ₹17 (iii) ₹7	1+1+2
14.	(i) ₹ 100 (ii) ₹ 300 (iii)₹ 1200	1+1+2
15.	(i) Total money collected by the school DPS is Rs. 7000 (ii) Total money collected by all the schools is Rs. 18500 (iii) The total articles sold by the schools is 330	4
16.	(i) The matrices are P = $\begin{bmatrix}4 & 6 & 2\\2 & 2 & 4\end{bmatrix}$ Q = $\begin{bmatrix}2400\\1900\\1800\end{bmatrix}$ and R = $\begin{bmatrix}45\\55\\33\end{bmatrix}$ (ii) Here PQ = $\begin{bmatrix}4 & 6 & 2\\2 & 2 & 4\end{bmatrix}\begin{bmatrix}2400\\1900\\1800\end{bmatrix}$ $= \begin{bmatrix}24600\\15800\end{bmatrix}$ And PR = $\begin{bmatrix}4 & 6 & 2\\2 & 2 & 4\end{bmatrix}\begin{bmatrix}45\\55\\33\end{bmatrix}$ $= \begin{bmatrix}576\\332\end{bmatrix}$ Hence total requirement of calories and protein for family A are 24600 and 576 grams respectively and total requirement of calories and protein for family B are 15800 and 332 grams respectively.	4

CHAPTER-3

MATRICES

05 MARK TYPE QUESTIONS

<table>
<tr><th>Q. NO</th><th>QUESTION</th><th>MARK</th></tr>
<tr><td>1.</td><td>A manufacture produces three stationery products Pencil, Eraser and Sharpener which he sells in two markets. Annual sales are indicated below.
Market Products (in numbers)
Pencil Eraser Sharpener
A 10,000 2,000 18,000
B 6,000 20,000 8,000

If the unit sale price of Pencil, Eraser and Sharpener are Rs.2.50, Rs.1.50and Rs.1.00 respectively, and unit cost of the above three commodities are Rs.2.00, Rs.1.00 and Rs.0.50 respectively, then
1) Total revenue of market A
A) Rs.64,000 B) Rs.60,400 C) Rs.46,000 D) Rs.40,600
2) Total revenue of market B is
A) Rs.35,000 B) Rs.53,000 C) Rs.50,300 D) Rs.30,500
3) Cost incurred in market A :
A) Rs.13,000 B) Rs.30,100 C) Rs.10,300 D) Rs.31,000
4) Cost incurred in market B :
A) Rs.13,000 B) Rs.30,100 C) Rs.10,300 D) Rs.31,000
5) Profits in market A and B respectively are
A) (Rs,15,000, Rs.17,000) B) (Rs.17,000, Rs.15,000)
C) (Rs.51,000, Rs.71,000) C) (Rs.10,000, Rs.20,000)</td><td>5</td></tr>
<tr><td>2.</td><td>Three school DPS, CVC and KVS decided to organize a fair for collecting money for helping the flood victims. They sold handmade fans, mats and plates from recycled material at a cost of Rs.25, Rs.100 and Rs.50 each respectively. The number of articles sold are given as
<table>
<tr><td>School/Article</td><td>DPS</td><td>CVC</td><td>KVS</td></tr>
<tr><td>Handmade fans</td><td>40</td><td>25</td><td>35</td></tr>
<tr><td>Mats</td><td>50</td><td>40</td><td>50</td></tr>
<tr><td>Plates</td><td>20</td><td>30</td><td>40</td></tr>
</table>
1. What is the total money collected by the school DPS?
A) Rs.700 B) Rs.7000 C) Rs.6125 D) Rs.7875
2. What is the total amount of money collected by schools CVC and KVS?
A) Rs.14000 B) Rs.15,725 C) Rs.21000 D) 13,125
3. What is the total amount of money collected by all three school DPS, CVC and KVS?
A) Rs.15775 B) Rs.14,000 C) Rs.21,000 D) Rs.17125
4. How many articles are sold by three schools?
A) 230 B) 130 C) 430 D) 330
5. What is the total amount of money collected by all three school DPS, CVC?
A) Rs.14875 B) Rs.13000 C) Rs.14975 D) Rs.13875</td><td>5</td></tr>
<tr><td>3.</td><td>PROMOTING AWARENESS FOR WOMEN
To promote the making of toilet for women, an organization tried to generate awareness through
➢ House call
➢ Letters</td><td>5</td></tr>
</table>

➢ Announcement

The cost for each attempt is given bellow

- Rs.50
- Rs.20
- Rs.40

The number of attempts made in three villages X, Y and Z are given bellow

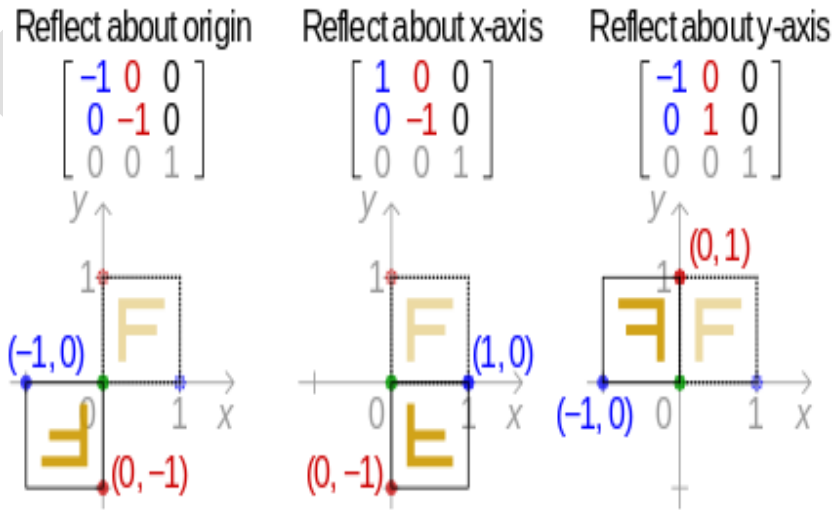
	House call	Letters	Announcements
X	400	300	100
Y	300	250	75
Z	500	400	150

Find the total cost incurred by the organization for three villages using matrices`

4. GEOMETRICAL TRANSFORMATION:- 5

Matrices allow arbitrary linear transformations to be displayed in a consistent format, suitable for computation. This also allows transformations to be composed easily (by multiplying their matrices).

Linear transformations like stretching, squeezing, rotation, shearing, reflection, orthogonal projection are not the only ones that can be represented by matrices.



- REFLECTION IN X-AXIS

If P(X,Y) is a point then its reflection in X-axis is P'(X',Y') where X'=X and Y'=-Y

Which can also be given by $\begin{pmatrix} X' \\ Y' \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix} \begin{pmatrix} X \\ Y \end{pmatrix}$

- REFLECTION IN Y-AXIS

If P(X,Y) is a point then its reflection in Y-axis is P'(X',Y') where X'=-X and Y'=Y

	Which can also be given by $\begin{pmatrix} X' \\ Y' \end{pmatrix} = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} X \\ Y \end{pmatrix}$ **REFLECTION IN ORIGIN** If P(X,Y) is a point then its reflection in origin is P'(X',Y') where X'=-X and Y'=-Y Which can also be given by $\begin{pmatrix} X' \\ Y' \end{pmatrix} = \begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix} \begin{pmatrix} X \\ Y \end{pmatrix}$ Using this concept of transformation find the reflection of the following points (a) (2,-3) in X-axis (b) (-5,7) in Y-axis (c) (11,23) in origin	
5.	 On her birthday, Seema decided to donate some money to children of an orphanage home. If there were 8 children less, everyone would have got Rs. 10 more. However, if there were 16 Children more, everyone would have got Rs. 10 less. Let the no. Of children be *x* and the amount of money distributed be *y* (in Rs.) I. Find the equation in term of *x* and *y* and represent it in the form of Matrix. II. Find the number of children who were given some money by seema. III. How much money is given to each child by Seema. OR How much money Seema spends in distributing the money to all the students of orphanage?	5
6.	 The monthly incomes of two brother Rakesh and Rajesh are in the ratio 3:4 and the monthly expenditures are in the ratio 5:7.Each brother save ₹15000 per month. Read the above instruction and answer the following questions. (i) If monthly income of Rakesh and Rajesh are ₹3x and ₹4x and their expenditure are ₹ 5y and ₹ 7y respectively, write the system of linear equations for the above problem. (ii) write the matrix equation for question (i). (iii) If AX = B, where A, B, X are matrices then, X is (a) AB (b) AB^{-1} (c) $A^{-1}B$ (d) BA^{-1} (iv) If A= $\begin{bmatrix} 3 & -5 \\ 4 & -7 \end{bmatrix}$ then, find A^{-1}. (v) Find the monthly income of Rakesh & Rajesh respectively?	5
7.	The monthly incomes of two brothers Rakesh and Rajesh are in the ratio 3:4 and the monthly expenditures are in the ratio 5:7. Each brother saves Rs. 15000 per month. For the above data, answer the following questions:	5

	(i) If monthly income of Rakesh and Rajesh are 3x and 4x and their expenditure are 5y and 7y respectively, then identify the system of linear equations for the above problem. (a) x – y = 15000, x + y = 15000 (b) 3x + 5y = 15000, 4x + 7y = 15000 (c) 3x - 5y = 15000, 4x - 7y = 15000 (d) 5x - 3y = 15000, x - 4y = 15000 (ii) Identify the matrix equation for the above situation. (a) AX=B, where A = $\begin{bmatrix} 1 & -1 \\ 1 & 1 \end{bmatrix}$, $X = (x\ y)^T$, $B = (15000\ 15000)^T$ (b) AX=B, where A = $\begin{bmatrix} 3 & 5 \\ 4 & 7 \end{bmatrix}$, $X = (x\ y)^T$, $B = (15000\ 15000)^T$ (c) AX=B, where A = $\begin{bmatrix} 5 & -3 \\ 1 & -4 \end{bmatrix}$, $X = (x\ y)^T$, $B = (15000\ 15000)^T$ (d) AX=B, where A = $\begin{bmatrix} 3 & -5 \\ 4 & -7 \end{bmatrix}$, $X = (x\ y)$T, $B = (15000\ 15000)^T$ (iii) Monthly incomes of Rakesh and Rajesh respectively are (a) 90,000 each (b) 90,000 and 1,20,000 (c) 1,20,000 and 90,000 (d) 30000 and 15000	
8.	Three friends Ravi, Raju and Rohit were buying and selling stationery items in a market. The price of per dozens of Pen, notebooks and toys are Rupees x, y and z respectively. Ravi purchases 4 dozen of notebooks and sells 2 dozen pens and 5 dozen toys. Raju purchases 2 dozen toys and sells 3 dozen pens and 1 dozen of notebooks. Rohit purchases one dozen of pens and sells 3 dozen notebooks and one dozen toys. In the process, Ravi, Raju and Rohit earn ₹ 1500, ₹ 100 and ₹400 respectively.  Answer the following questions using the matrix method: 1. What is the price of one dozen of pens? 2. What is the total price of one dozen of pens and one dozen of notebooks?	5

3. What is the sale amount of Ravi?
4. What is the amount of purchases made by all three friends?
5. What is the price of sales made by all three friends?

9. For the matrix A=$\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$, show that $A^2 - 5A + 4I = 0$. Hence find A^{-1}. — 5

10. For what value of x ,$\begin{bmatrix} 1 & 2 & 1 \end{bmatrix} \begin{bmatrix} 1 & 2 & 0 \\ 2 & 0 & 1 \\ 1 & 0 & 2 \end{bmatrix} \begin{bmatrix} 0 \\ 2 \\ x \end{bmatrix} = 0$. — 5

11. **Read the text carefully and answer the questions:** Three schools A, B and C organized a mela for collecting funds for helping the rehabilitation of flood victims. They sold handmade fans, mats, and plates from recycled material at a cost of₹ 25, ₹ 100 and ₹ 50 each. The number of articles sold by school A, B, C are given below. — 5

Article	School	A	B	C
Fans		40	25	35
Mats		50	40	50
Plates		20	30	40

1. Represent the sale of handmade fans, mats and plates by three schools A, B and C and the sale prices (in₹) of given products per unit, in matrix form.
2. Find the funds collected by school A, B and C by selling the given articles.
3. If they increase the cost price of each unit by 20%, then write the matrix representing new price.
4. Find the total funds collected for the required purpose after 20% hike in price.

12. **Read the text carefully and answer the questions:** The nut and bolt manufacturing business has gained popularity due to the rapid Industrialization and introduction of the Capital - Intensive Techniques in the Industries that are used as the Industrial fasteners to connect various machines and structures. Mr. Suresh is in Manufacturing business of Nuts and bolts. He produces three types of bolts, x, y, and z which he sells in two markets. Annual sales (in₹) indicated below: — 5

Markets	Products		
	x	y	z
I	10000	2000	18000
II	6000	20000	8000

1. If unit sales prices of x, y and z are₹ 2.50, ₹ 1.50 and ₹ 1.00 respectively, then find the total revenue collected from Market - I &II.
2. If the unit costs of the above three commodities are₹ 2.00, ₹ 1.00 and 50 paise respectively, then find the cost price in Market I and Market II.
3. If the unit costs of the above three commodities are₹ 2.00, ₹ 1.00 and 50 paise respectively,

	then find gross profit from both the markets. 4. If matrix A = $[a_{ij}]_{2\times2}$ where $a_{ij} = 1$, if $i \neq j$ and $a_{ij} = 0$, if $i = j$ then find A^2 .	
13.	If A = $\begin{bmatrix} 0 & -tan\alpha/2 \\ tan\alpha/2 & 0 \end{bmatrix}$ and I is the identity matrix of order 2, show that $I + A = (I - A)\begin{bmatrix} cos\alpha & -sin\alpha \\ sin\alpha & cos\alpha \end{bmatrix}$	5
14.	Express the following matrix A as the sum of a symmetric and a skew symmetric matrix A= $\begin{bmatrix} 3 & 2 & 5 \\ 4 & 1 & 3 \\ 0 & 6 & 7 \end{bmatrix}$.	5
15.	A manufacturer produces three products x, y, z which he sells in two markets. Annual sales are indicated below: Market Products I 10000 2000 18000 II 6000 20000 8000 (a) If unit sales prices o 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.	5
16.	Two farmers Ram and Shyam cultivates only three varieties of rice namely Basmati, Permal and Naura. The sale (in rupees) of these varieties of rice by both the farmers in the month of October and November are given by the following matrices A and B October sales (in rupees) Basmati Permal Naura A = $\begin{bmatrix} 10000 & 20000 & 30000 \\ 50000 & 30000 & 10000 \end{bmatrix}$ $\begin{matrix} Ram \\ Shyam \end{matrix}$ November sales (in rupees) Basmati Permal Naura B = $\begin{bmatrix} 5000 & 10000 & 6000 \\ 20000 & 10000 & 10000 \end{bmatrix}$ $\begin{matrix} Ram \\ Shyam \end{matrix}$ (i) Find the combined sales in October and November for each farmer in each variety. (ii) Find the decrease in sales October to November. (iii) If both farmers receive2 % profit on gross sales, compute the profit for each farmer and for each variety sold in November.	5

ANSWERS:

Q. NO	ANSWER	MARKS
1.	1-C, 2-B 3-D 4-C 5-A	5
2.	1-B 2-A 3-C 4-D 5-A	5
3.	Ans:- The above problem can be represented by matrices as- Cost matrix A =$[house\ call \quad letters \quad announcement]$ $= [50 \quad 20 \quad 40]$ $\begin{matrix} & X & Y & Z \end{matrix}$ No. of attempts in villages B =$\begin{bmatrix} 400 & 300 & 500 \\ 300 & 250 & 400 \\ 100 & 75 & 150 \end{bmatrix}$ The total cost in making the awareness is given by AB i.e AB=$[50 \quad 20 \quad 40]\begin{bmatrix} 400 & 300 & 500 \\ 300 & 250 & 400 \\ 100 & 75 & 150 \end{bmatrix}$ $=\begin{bmatrix} 30000 \\ 23000 \\ 39000 \end{bmatrix}$ Thus the cost incurred to the promote making toilets for women in villages X, Y and Z are RS.30000 ,RS.23000 and RS.39000 respectively.	5
4.	Ans:- **(a)** The reflection of P(2,-3) is $\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}\begin{pmatrix} 2 \\ -3 \end{pmatrix} = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$;P'(2,3) **(b)** the reflection of Q(-5,7) is $\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}\begin{pmatrix} -5 \\ 7 \end{pmatrix} = \begin{pmatrix} 5 \\ 7 \end{pmatrix}$;Q'(5,7) **(c)** the reflection of R(11,23) is $\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}\begin{pmatrix} 11 \\ 23 \end{pmatrix} = \begin{pmatrix} -11 \\ -23 \end{pmatrix}$;R'(-11,-23)	5
5.	(i) $5x-4y=40$ $5x-8y=-80$ $A=\begin{bmatrix} 5 & -4 \\ 5 & -8 \end{bmatrix}, X=\begin{bmatrix} x \\ y \end{bmatrix}, \mathrm{B}=\begin{bmatrix} 40 \\ -80 \end{bmatrix}$ (ii) 33 (iii)30 or 960	5
6.	(i) $3x-5y=15000; 4\,\mathrm{x}-7\,\mathrm{y}=15000$ (ii) AX=B Where A = $A=\begin{bmatrix} 3 & -5 \\ 4 & -7 \end{bmatrix}, X=\begin{bmatrix} x \\ y \end{bmatrix}, \mathrm{B}=\begin{bmatrix} 15000 \\ 15000 \end{bmatrix}$ (iii) (c) (iv) $\begin{bmatrix} 7 & -5 \\ 4 & -3 \end{bmatrix}$	5

	$X = A^{-1}B$ (v) $\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 7 & -5 \\ 4 & -3 \end{bmatrix} \begin{bmatrix} 15000 \\ 15000 \end{bmatrix} = \begin{bmatrix} 30000 \\ 15000 \end{bmatrix}$ Monthly income of Rajesh= 120000 Monthly income of Rakesh= 90000	
7.	The equations are, 3x - 5y = 15000, 4x - 7y = 15000 In matrix form AX=B, where A = $\begin{pmatrix} 3 & -5 \\ 4 & -7 \end{pmatrix}$, $X = \begin{pmatrix} x \\ y \end{pmatrix}$,$B = \begin{pmatrix} 15000 \\ 15000 \end{pmatrix}$ $A^{-1} = \begin{pmatrix} 7 & -5 \\ 4 & -3 \end{pmatrix}$ $X = A^{-1} B = \begin{pmatrix} 7 & -5 \\ 4 & -3 \end{pmatrix} \begin{pmatrix} 15000 \\ 15000 \end{pmatrix} = \begin{pmatrix} 30000 \\ 15000 \end{pmatrix}$ Answers: (i) c (ii) d (iii) b	5
8.	Given, The price of per dozen of Pen, Notebook and toys are Rupees x. y and z respectively A/Q, 2x - 4y + 5z = 1500 3x + y - 2z = 100Type equation here. -x + 3y + z = 400 In matrix form, **AX=B , i.e** $\begin{bmatrix} 2 & -4 & 5 \\ 3 & 1 & -2 \\ -1 & 3 & 1 \end{bmatrix} \begin{bmatrix} X \\ Y \\ Z \end{bmatrix} = \begin{bmatrix} 1500 \\ 100 \\ 400 \end{bmatrix}$ Implies $\begin{bmatrix} X \\ Y \\ Z \end{bmatrix} = \boldsymbol{A^{-1}B}$ Implies X=200 Y=100 Z=300 (1) Rupees 100 (2) rupees 300(100+200) (3) Sell amount of Ravi= Rupees 1900 (4) Total amount of purchases= rupees 1100 (5) Total price of sells= rupees 3200	5
9.	Here A=$\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ now LHS A^2-5A +4I=$\begin{bmatrix} 6 & -5 & 5 \\ -5 & 6 & -5 \\ 5 & -5 & 6 \end{bmatrix} - 5\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix} + 4\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix} =$ 0 *PROVED*	5

10.	Here $[1\ \ 2\ \ 1]\begin{pmatrix}1 & 2 & 0\\ 2 & 0 & 1\\ 1 & 0 & 2\end{pmatrix}\begin{bmatrix}0\\ 2\\ x\end{bmatrix}$=0 or$[6\ \ 2\ \ 4]\begin{bmatrix}0\\ 2\\ x\end{bmatrix}$=0 or 4+4x=0 or 4x=-4 or x=-1	5
11.	(i) Let P = $\begin{bmatrix}40 & 50 & 20\\ 25 & 40 & 30\\ 35 & 50 & 40\end{bmatrix}$ and Q = $\begin{bmatrix}25\\ 100\\ 50\end{bmatrix}$ (ii) Clearly, total funds collected by each school is given by the matrix PQ = = $\begin{bmatrix}40 & 50 & 20\\ 25 & 40 & 30\\ 35 & 50 & 40\end{bmatrix}\begin{bmatrix}25\\ 100\\ 50\end{bmatrix}$ = = $\begin{bmatrix}7000\\ 6125\\ 7875\end{bmatrix}$ So, funds collected by school A is Rs. 7000 funds collected by school B is Rs. 6125 funds collected by school C is Rs. 7875 (iii) New price matrix Q = 120% of $\begin{bmatrix}25\\ 100\\ 50\end{bmatrix}$ = $\begin{bmatrix}25x1.2\\ 100x1.2\\ 50x1.2\end{bmatrix}$ = $\begin{bmatrix}30\\ 120\\ 60\end{bmatrix}$ (iv) Now, PQ = $\begin{bmatrix}40 & 50 & 20\\ 25 & 40 & 30\\ 35 & 50 & 40\end{bmatrix}\begin{bmatrix}30\\ 120\\ 60\end{bmatrix}$ = $\begin{bmatrix}8400\\ 7350\\ 9450\end{bmatrix}$ Total fund collected = 8400+7350+9450 = Rs. 25200	5
12.	(i) $Let\ A = \begin{bmatrix}10000 & 2000 & 18000\\ 6000 & 20000 & 8000\end{bmatrix}$ and B= $\begin{bmatrix}2.5\\ 1.5\\ 1\end{bmatrix}$ Now, Revenue = Sale price x Number of items sold = $\begin{bmatrix}10000 & 2000 & 18000\\ 6000 & 20000 & 8000\end{bmatrix}\begin{bmatrix}2.5\\ 1.5\\ 1\end{bmatrix}$ = $\begin{bmatrix}46000\\ 53000\end{bmatrix}$ So, revenue from Market I = Rs. 46,000 and revenue from Market II = Rs. 53000 (ii) Now, let C = $\begin{bmatrix}2\\ 1\\ 0.5\end{bmatrix}$ Then total Cost = AC = $\begin{bmatrix}10000 & 2000 & 18000\\ 6000 & 20000 & 8000\end{bmatrix}\begin{bmatrix}2\\ 1\\ 0.5\end{bmatrix}$ = $\begin{bmatrix}31000\\ 36000\end{bmatrix}$ Cost price in market I = Rs. 31000 and cost price in market II = Rs. 36000 (iii) So, Profit matrix = Revenue matrix – Cost matrix = $\begin{bmatrix}46000\\ 53000\end{bmatrix}$ - $\begin{bmatrix}31000\\ 36000\end{bmatrix}$ = $\begin{bmatrix}15000\\ 17000\end{bmatrix}$ Therefore, gross profit = Rs. 15000 + Rs. 17000 = Rs. 32000 (iv) A = $\begin{bmatrix}0 & 1\\ 1 & 0\end{bmatrix}$ A^2 = $\begin{bmatrix}0 & 1\\ 1 & 0\end{bmatrix}\begin{bmatrix}0 & 1\\ 1 & 0\end{bmatrix}$ = $\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$ = I	5
13.	Verification.	5
14.	1. Now , A can be written as A= ½(A+A′)+ ½ (A-A′)	5

	½ (A+A′)= $\begin{bmatrix} 3 & 3 & 5/2 \\ 3 & 1 & 9/2 \\ 5/2 & 9/2 & 7 \end{bmatrix}$ = P, say P′= P , So P is symmetric ½ (A-A′)= $\begin{bmatrix} 0 & -1 & 5/2 \\ 1 & 0 & -3/2 \\ -5/2 & 3/2 & 0 \end{bmatrix}$ = Q say, Q′= -Q, So Q is skew symmetric Now , we can check P + Q =A	
15.	(a) Let A = $\begin{bmatrix} 10000 & 2000 & 18000 \\ 6000 & 20000 & 8000 \end{bmatrix}$ and B = $\begin{bmatrix} 2.50 \\ 1.50 \\ 1.00 \end{bmatrix}$ Now Revenue, AB = $\begin{bmatrix} 10000 & 2000 & 18000 \\ 6000 & 20000 & 8000 \end{bmatrix} \begin{bmatrix} 2.50 \\ 1.50 \\ 1.00 \end{bmatrix}$ = $\begin{bmatrix} 46000 \\ 53000 \end{bmatrix}$ Hence, revenue for market I is Rs. 46000 and revenue for market II is Rs. 53000 (b) Let P = $\begin{bmatrix} 10000 & 2000 & 18000 \\ 6000 & 20000 & 8000 \end{bmatrix}$ and Q = $\begin{bmatrix} 2.00 \\ 1.00 \\ 0.50 \end{bmatrix}$ Then total cost, PQ = $\begin{bmatrix} 10000 & 2000 & 18000 \\ 6000 & 20000 & 8000 \end{bmatrix} \begin{bmatrix} 2.00 \\ 1.00 \\ 0.50 \end{bmatrix}$ = $\begin{bmatrix} 31000 \\ 36000 \end{bmatrix}$ Gross profit for market I = Revenue – total cost = Rs. 46000 – Rs. 31000 = Rs, 15000 Gross profit for market II = Revenue – total cost = Rs. 53000 – Rs. 36000 = Rs, 17000	5
16.	(i) Combined sales in October and November for each farmer is given by A + B = $\begin{bmatrix} 15000 & 30000 & 36000 \\ 70000 & 40000 & 20000 \end{bmatrix}$ (ii) Change in sale from October to November is given by A – B = $\begin{bmatrix} 5000 & 10000 & 24000 \\ 30000 & 20000 & 0 \end{bmatrix}$ (iii) 2% of B = $\frac{2}{100}\begin{bmatrix} 5000 & 10000 & 6000 \\ 20000 & 10000 & 10000 \end{bmatrix}$ = $\begin{bmatrix} 100 & 200 & 120 \\ 400 & 200 & 200 \end{bmatrix}$ Hence, in November Ram receives Rs. 100, Rs. 200 and Rs. 120 as profit in the sale of each variety of rice, respectively, and Shyam receives profit of Rs. 400, Rs. 200 and Rs. 200 in the sale of each variety of rice, respectively.	5

ARTHAM
RESOURCE MATERIAL
NO. 1 EDUCATIONAL RESOURCES

As Per Revised CBSE Curriculum 2023-24

Classroom Teaching & Animated Videos Playlists

We take immense pleasure in serving you. Now, revel in our seamless online services completely free of charge. view our animated and classroom teaching Playlists customized for students from grade 1 to 12,Covering a wide range of subjects to enhance your comprehension and knowledge. Simply click on the provided playlist links to access **Playlists based on the latest NCERT Syllabus for 2023-24.**

Our content includes Competency-Based Questions, Assertion-Reason Questions, Previous Year Questions (PYQ), and Case Study-Based Questions to enhance your learning experience. For the most up-to-date videos, consider subscribing to our YouTube channel at https://www.youtube.com/@PrincipalsHandbookandDiaryadditionally, you're encouraged to join our expanding WhatsApp community group to stay updated with the latest curriculum-related content and updates.

We are committed to enriching your educational journey!!!

NAGEEN GROUP
tamso ma jyotirgamaya

Nageen Group of Schools

ANIMATED & CLASSROM TEACHING VIDEOS PLAYLISTS

(As per revised CBSE Curriculum– 2023-24)

ANIMATED VIDEOSPLAYLISTS (CLASS 1)	
Class 1 EVS(EnglishLanguage)(CBSE)	Click here for playlist
Class 1 Mathematics (EnglishLanguage)(CBSE)	Click here for Playlist
Class 1 EVS (HindiLanguage)(CBSE)	Click here for Playlist
Class 1 Mathematics(Hindi Language)(CBSE)	Click here for Playlist
ANIMATED VIDEOS PLAYLISTS (CLASS 2)	
Class 2 EVS (EnglishLanguage)(CBSE)	Click here for Playlist
Class 2 Mathematics (EnglishLanguage)(CBSE)	Click here for Playlist
Class 2 EVS(HindiLanguage)(CBSE)	Click here for Playlist
Class 2 Mathematics (Hindi Language)(CBSE)	Click here for Playlist
ANIMATED VIDEOS PLAYLISTS (CLASS 3)	
Class 3 Mathematics (EnglishLanguage)(CBSE)	Click here for Playlist
Class 3 EVS (EnglishLanguage)(CBSE)	Click here for Playlist
Class 3 EVS (HindiLanguage)(CBSE)	Click here for Playlist
Class 3 Mathematics (HindiLanguage)(CBSE)	Click here for Playlist
ANIMATED VIDEOS PLAYLISTS (CLASS 4)	
Class 4 Mathematics (EnglishLanguage)(CBSE)	Click here for Playlist
Class 4 EVS(EnglishLanguage)(CBSE)	Click here for Playlist
Class 4 Mathematics (HindiLanguage)(CBSE)	Click here for Playlist
Class 4 EVS (HindiLanguage)(CBSE)	Click here for Playlist
CLASSROOM TEACHING VIDEOS PLAYLISTS (CLASS 4)	
Class 4 General Science (CBSE)	Click here for Playlist
ANIMATED VIDEOS PLAYLISTS (CLASS 5)	
Class 5 Mathematics (EnglishLanguage)(CBSE)	Click here for Playlist
Class 5 Science (EnglishLanguage)(CBSE)	Click here for Playlist
Class 5 Mathematics(HindiLanguage)(CBSE)	Click here for Playlist
Class 5 Science (HindiLanguage)(CBSE)	Click here for Playlist
CLASSROOM TEACHING VIDEOS PLAYLISTS (CLASS 5)	
Class 5 General Science (CBSE)	Click here for Playlist
Class 5 EVS (CBSE)	Click here for Playlist

ANIMATED VIDEOS PLAYLISTS(CLASS 6)	
Class 6 Mathematics (EnglishLanguage)(CBSE)	Click here for Playlist
Class 6 Social Science (EnglishLanguage)(CBSE)	Click here for Playlist
Class 6 Science (EnglishLanguage) (CBSE)	Click here for Playlist
Class 6 Mathematics (Hindi Language)(CBSE)	Click here for Playlist
Class 6 Science All Chapters (CBSE)	Click here for Playlist
CLASSROOM TEACHING VIDEOS PLAYLISTS (CLASS 6)	
Class 6 Mathematics (CBSE)	Click here for Playlist
Class 6 Social Science (CBSE)	Click here for Playlist
Class 6 Sanskrit (CBSE)	Click here for Playlist
Class 6 Hindi (CBSE)	Click here for Playlist
Class 6 Science (CBSE)	Click here for Playlist
ANIMATED VIDEOS PLAYLISTS (CLASS 7)	
Class 7 Science(CBSE)	Click here for Playlist
Class 7 Mathematics(CBSE)	Click here for Playlist
Class 7 Social Science(CBSE)	Click here for Playlist
Class 7 Mathematics(CBSE)	Click here for Playlist
Class 7 Science (CBSE)	Click here for Playlist
CLASSROOM TEACHING VIDEOS PLAYLISTS (CLASS 7)	
Class 7 Science (CBSE)	Click here for Playlist
Class 7 Hindi (CBSE)	Click here for Playlist
Class 7 Sanskrit (CBSE)	Click here for Playlist
Class 7 Social Science (CBSE)	Click here for Playlist
Class 7 Mathematics (CBSE)	Click here for Playlist
ANIMATED VIDEOS PLAYLISTS (CLASS 8)	
Class 8 Science(CBSE)	Click here for Playlist
Class 8 Mathematics(CBSE)	Click here for Playlist
Class 8 Social Science(CBSE)	Click here for Playlist
Class 8 Mathematics(CBSE)	Click here for Playlist
Class 8 Science(CBSE)	Click here for Playlist
CLASSROOM TEACHING VIDEOS PLAYLISTS (CLASS 8)	
Class 8 Hindi (CBSE)	Click here for Playlist
Class 8 Sanskrit (CBSE)	Click here for Playlist
ANIMATED VIDEOS PLAYLISTS (CLASS 9)	
Class 9 Biology(CBSE)	Click here for Playlist
Class 9 Physics(CBSE)	Click here for Playlist
Class 9 Chemistry(CBSE)	Click here for Playlist
Class 9 Social Science (CBSE)	Click here for Playlist

Class 9 Mathematics (CBSE)	Click here for Playlist
Class 9 Science (CBSE)	Click here for Playlist
CLASSROOM TEACHING VIDEOS PLAYLISTS (CLASS 9)	
Class 9 Social Science (CBSE)	Click here for Playlist
Class 9 Mathematics(CBSE)	Click here for Playlist
Class 9 English (CBSE)	Click here for Playlist
Class 9 Hindi (CBSE)	Click here for Playlist
ANIMATED VIDEOS PLAYLISTS (CLASS 10)	
Class 10 Biology (CBSE)	Click here for Playlist
Class 10 Physics (CBSE)	Click here for Playlist
Class 10 Chemistry (CBSE)	Click here for Playlist
Class 10 Social Science (CBSE)	Click here for Playlist
Class 10 Mathematics(CBSE) (English Language)	Click here for Playlist
Class 10 Mathematics(CBSE) (Hindi Language)	Click here for Playlist
Class 10 Science(CBSE) (Hindi Language)	Click here for Playlist
CLASSROOM TEACHING VIDEOS PLAYLISTS (CLASS 10)	
Class 10 English (CBSE)	Click here for Playlist
Class 10 Hindi (CBSE)	Click here for Playlist
Class 10 Mathematics (CBSE)	Click here for Playlist
Class 10 Social Science (CBSE)	Click here for Playlist
Class 10 Magical Science Board Exam Preparation in 1 min (CBSE)	Click here for Playlist
Class 10: Science (CBSE)	Click here for Playlist
ANIMATED VIDEOS PLAYLISTS (CLASS 11)	
Class 11 Physics (CBSE) (English Language)	Click here for Playlist
Class 11 Chemistry (CBSE) (English Language)	Click here for Playlist
Class 11 Biology (CBSE) (English Language)	Click here for Playlist
Class 11 Mathematics(CBSE) (English Language)	Click here for Playlist
Class 11 Accountancy (CBSE) (English Language)	Click here for Playlist
Class 11 Business Studies (CBSE) (English Language)	Click here for Playlist
Class 11 Statistics (CBSE) (English Language)	Click here for Playlist
Class 11 Biology (CBSE) (Hindi Language)	Click here for Playlist
Class 11 Mathematics (CBSE) (Hindi Language)	Click here for Playlist
Class 11 Physics (CBSE) (Hindi Language)	Click here for Playlist
Class 11 Chemistry (CBSE) (Hindi Language)	Click here for Playlist
Class 11Micro Economy (CBSE) (English Language)	Click here for Playlist
CLASSROOM TEACHING VIDEOS PLAYLISTS (CLASS 11)	
Class 11Mathematics (CBSE)	Click here for Playlist
Class 11 Accounts (CBSE)	Click here for Playlist
Class 11 Business Studies (CBSE)	Click here for Playlist

Class 11 Hindi (CBSE)	Click here for Playlist
Class 11 Psychology (CBSE)	Click here for Playlist
Class 11 Economics (CBSE)	Click here for Playlist
Class 11 Physics (CBSE)	Click here for Playlist
Class 11 Chemistry (CBSE)	Click here for Playlist
Class 11 English (CBSE)	Click here for Playlist
Class 11 Biology (CBSE)	Click here for Playlist
Class 11 Biology Shorts (CBSE)	Click here for Playlist
ANIMATED VIDEOS PLAYLISTS (CLASS 12)	
Class 12 Physics (CBSE)	Click here for Playlist
Class 12 Chemistry (CBSE)	Click here for Playlist
Class 12 Biology(CBSE)	Click here for Playlist
Class 12 Macro Economy (CBSE)	Click here for Playlist
Class 12Economic (CBSE)	Click here for Playlist
Class 12 Mathematics (CBSE)	Click here for Playlist
Class 12 Accountancy (CBSE)	Click here for Playlist
Class 12 Business Studies (CBSE)	Click here for Playlist
Class 12 Physics (CBSE)	Click here for Playlist
Class 12 Mathematics (CBSE)	Click here for Playlist
Class 12 Biology (CBSE)	Click here for Playlist
Class 12 Chemistry (CBSE)	Click here for Playlist
CLASSROOM TEACHING VIDEOS PLAYLISTS (CLASS 12)	
Class 12 CHEMISTRY (CBSE)	Click here for Playlist
Class 12 Business Studies (CBSE)	Click here for Playlist
Class 12 Hindi (CBSE)	Click here for Playlist
NEET Biology in 1 min	Click here for Playlist
Class 12 History (CBSE)	Click here for Playlist
Class 12 Political Science (CBSE)	Click here for Playlist
Class 12 Physics (CBSE)	Click here for Playlist
Class 12 Biology (CBSE)	Click here for Playlist
Class 12 : Accounts (CBSE)	Click here for Playlist

SCHOOL OF EDUCATORS

You will get Pre- Board Papers PDF, Word file, PPT, Lesson Plan, Worksheet, practical tips and Viva questions , reference books , smart content , curriculum , syllabus , marking scheme , toppers answer scripts , revised exam pattern , revised syllabus , Blue Print etc. here .**Join Your Subject WhatsApp Group.**

Kindergarten
Click to Join

Class 1
Click to Join

Class 2
Click to Join

Class 3
Click to Join

Class 4
Click to Join

Class 5
Click to Join

Class 6
Click to Join

Class 7
Click to Join

Class 8
Click to Join

Class 9
Click to Join

Class 10
Click to Join

Class 11 (Science)
Click to Join

Class 11 (Commerce)
Click to Join

Class 11 (Humanities)
Click to Join

Class 12 (Science)
Click to Join

Class 12 (Commerce)
Click to Join

Class 12 (Humanities)
Click to Join

Subject Wise Groups Secondary and Senior Secondary

Secondary Groups (IX & X)

SST
Click to Join

Mathematics
Click to Join

Science
Click to Join

English
Click to Join

Hindi
Click to Join

Information Techonology (402)
Click to Join

Senior Secondary Groups (XI & XII)

Physics
Click to Join

Chemistry
Click to Join

English
Click to Join

Mathematics
Click to Join

Biology
Click to Join

Accountancy
Click to Join

Economics
Click to Join

BST
Click to Join

History
Click to Join

Geography
Click to Join

Sociology
Click to Join

Hindi Elective
Click to Join

Hindi Core
Click to Join

Home Science
Click to Join

Sanskrit
Click to Join

Psychology
Click to Join

Political Science
Click to Join

Painting
Click to Join

Vocal Music
Click to Join

Comp. Science
Click to Join

IP
Click to Join

Physical Education
Click to Join

App. Mathematics
Click to Join

IIT /NEET
Click to Join

Leagal Studies
Click to Join

Entrepreneurship
Click to Join

French
Click to Join

Teachers Jobs
Click to Join

SOE CBSE Principals (Group for Principals Only)
Click to Join

Rules & Regulations of the Group

1. No introduction
2. No Good Morning/Any wish type message
3.No personal Chats & Messages
4. No Spam
5. You can also ask your difficulties here.

Just get learning resources & post learning resources.

Helpline number only WhatsApp: +91-95208-77777

Why Artham Resource Material?

Resource materials for teachers and students are essential tools for effective teaching and learning. They provide valuable information, guidance, and support to both teachers and students, making the teaching and learning process more efficient and productive.

For teachers, Artham resource materials include lesson plans, instructional guides, assessment tools, professional development materials, and teaching aids. These materials are well researched and created according to 2023-24 NEP and NCERT guidelines.

For students, resource materials can include textbooks, study guides, homework assignments, reference books, online learning platforms, and educational videos. These materials can be obtained from school libraries, educational publishers, online resources, and teachers.

Both teachers and students can also benefit from Artham educational resources which are free and openly licensed educational materials that can be used and shared for teaching and learning. Artham resource material include textbooks, courses, lesson plans, and multimedia resources that are available online.

In summary, resource materials are critical components of effective teaching and learning. They provide a wealth of information and support that can enhance the quality of education and help students achieve academic success.

Teachers and students can also purchase these resources from the links provided with every resource.

JOIN TELEGRAM GROUP/CHANNELS FOR CLASS WISE HIGH QUALITY RESOURCE MATERIAL

SOE CBSE Groups

- Click to Join CBSE Group...All classes
- Click to Join SOE CBSE Kindergarten Group
- Click to Join SOE CBSE Class 1 Group
- Click to Join SOE CBSE Class 2 Group
- Click to Join SOE CBSE Class 3 Group
- Click to Join SOE CBSE Class 4 Group
- Click to Join SOE CBSE Class 5 Group
- Click to Join SOE CBSE Class 6 Group
- Click to Join SOE CBSE Class 7 Group
- Click to Join SOE CBSE Class 8 Group
- Click to Join SOE CBSE Class 9 Group
- Click to Join SOE CBSE Class 10 Group
- Click to Join SOE CBSE Class 11 (Science) Group
- Click to Join SOE CBSE Class 11 (Commerce) Group
- Click to Join SOE CBSE Class 11 (Humanities) Group
- Click to Join SOE CBSE Class 12 (Science) Group
- Click to Join SOE CBSE Class 12(Commerce) Group

- Click to Join SOE CBSE Class 12 (Humanities) Group
- Click to Join SOE JEE/NEET Group
- Click to Join SOE CUET Group
- Click to Join SOE NDA, OLYMPIAD, NTSE Group
- Click to Join SOE School Principal Professional Development Group
- Click to Join SOE School Teacher Professional Development Group
- Click to Join SOE CBSE Project File Group for Class 9th to 12th All Subjects

SOE ICSE Groups

- Click to Join SOE ICSE Kindergarten Group
- Click to Join SOE ICSE Class 1 Group
- Click to Join SOE ICSE Class 2 Group
- Click to Join SOE ICSE Class 3 Group
- Click to Join SOE ICSE Class 4 Group
- Click to Join SOE ICSE Class 5 Group
- Click to Join SOE ICSE Class 6 Group
- Click to Join SOE ICSE Class 7 Group
- Click to Join SOE ICSE Class 8 Group
- Click to Join SOE ICSE Class 9 Group
- Click to Join SOE ICSE Class 10 Group
- Click to Join SOE ICSE Class 11 (Science) Group
- Click to Join SOE ICSE Class 11 (Commerce) Group
- Click to Join SOE ICSE Class 11 (Humanities) Group
- Click to Join SOE ICSE Class 12 (Science) Group
- Click to Join SOE ICSE Class 12(Commerce) Group
- Click to Join SOE ICSE Class 12 (Humanities) Group
- Click to Join SOE JEE/NEET Group
- Click to Join SOE CUET Group
- Click to Join SOE NDA, OLYMPIAD, NTSE Group
- Click to Join SOE School Principal Professional Development Group
- Click to Join SOE School Teacher Professional Development Group

Nageen CBSE Channels

- Click to Join Nageen CBSE Kindergarten Channel
- Click to Join Nageen CBSE Class 1 Channel
- Click to Join Nageen CBSE Class 2 Channel
- Click to Join Nageen CBSE Class 3 Channel
- Click to Join Nageen CBSE Class 4 Channel
- Click to Join Nageen CBSE Class 5 Channel
- Click to Join Nageen CBSE Class 6 Channel
- Click to Join Nageen CBSE Class 7 Channel
- Click to Join Nageen CBSE Class 8 Channel
- Click to Join Nageen CBSE Class 9 Channel
- Click to Join Nageen CBSE Class 10 Channel
- Click to Join Nageen CBSE Class 11 (Science) Channel
- Click to Join Nageen CBSE Class 11 (Humanities) Channel
- Click to Join Nageen CBSE Class 11 (Commerce) Channel
- Click to Join Nageen CBSE Class 12 (Science) Channel
- Click to Join Nageen CBSE Class 12 (Commerce) Channel
- Click to Join Nageen CBSE Class 12 (Humanities) Channel

- Click to Join JEE/NEET Channel
- Click to Join CUET Channel
- Click to Join NDA, OLYMPIAD, NTSE Channel

Nageen ICSE Channels

- Click to Join Nageen ICSE Kindergarten Channel
- Click to Join Nageen ICSE Class 1 Channel
- Click to Join Nageen ICSE Class 2 Channel
- Click to Join Nageen ICSE Class 3 Channel
- Click to Join Nageen ICSE Class 4 Channel
- Click to Join Nageen ICSE Class 5 Channel
- Click to Join Nageen ICSE Class 6 Channel
- Click to Join Nageen ICSE Class 7 Channel
- Click to Join Nageen ICSE Class 8 Channel
- Click to Join Nageen ICSE Class 9 Channel
- Click to Join Nageen ICSE Class 10 Channel
- Click to Join Nageen ICSE Class 11 (Science) Channel
- Click to Join Nageen ICSE Class 11 (Commerce) Channel
- Click to Join Nageen ICSE Class 11 (Humanities) Channel
- Click to Join Nageen ICSE Class 12 (Science) Channel
- Click to Join Nageen ICSE Class 12 (Commerce) Channel
- Click to Join Nageen ICSE Class 12 (Humanities) Channel
- Click to Join JEE/NEET Channel
- Click to Join CUET Channel
- Click to Join NDA, OLYMPIAD, NTSE Channel