PARISHRAM 2025

Mathematics

DPP: 4

Matrices

Q1 How many matrices of different orders are possible with elements comprising all prime numbers less than 30 ?

(A) 2 (B) 4

(C) 3 (D) 6

Q2 If A and B both are symmetric, then $AB - BA$ is

(A) symmetric matrix

(B) skew symmetric matrix

(C) both symmetric and skew symmetric

(D) neither symmetric nor skew symmetric

Q3 If A is a skew symmetric matrix then A^n will be (where n is an even natural number)

(A) symmetric matrix

(B) skew symmetric matrix

(C) both symmetric and skew symmetric matrix

(D) none of these

Q4 If $A = \begin{bmatrix} 0 & 2 \\ 2 & 0 \end{bmatrix}$, then A^2 is

(A) $\begin{bmatrix} 0 & 4 \\ 4 & 0 \end{bmatrix}$

(B) $\begin{bmatrix} 4 & 0 \\ 4 & 0 \end{bmatrix}$

(C) $\begin{bmatrix} 0 & 4 \\ 0 & 4 \end{bmatrix}$

(D) $\begin{bmatrix} 4 & 0 \\ 0 & 4 \end{bmatrix}$

Q5 How many distinct matrices exist with all four entries taken from $\{1, 2\}$?

(A) 16 (B) 24

(C) 48 (D) 32

Q6 If $\begin{bmatrix} 2 & 3 \\ 5 & 7 \end{bmatrix}\begin{bmatrix} 1 & -3 \\ -2 & 4 \end{bmatrix} = \begin{bmatrix} -4 & 6 \\ -9 & x \end{bmatrix}$ find the value of $\boldsymbol{x}$.

(A) 15 (B) 14

(C) 13 (D) None of these

Q7 If $A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$, then the value of $A^T A$ is equal to

(A) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ (B) $\begin{bmatrix} 1 & -1 \\ 0 & 1 \end{bmatrix}$

(C) $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ (D) $\begin{bmatrix} 0 & 0 \\ 1 & 1 \end{bmatrix}$

Q8 If $M - 2N = \begin{pmatrix} 1 & -2 \\ 3 & 0 \end{pmatrix}$ and $2M - 3N = \begin{pmatrix} -2 & 2 \\ 3 & -3 \end{pmatrix}$, then $N =$

(A) $\begin{pmatrix} 4 & -6 \\ 3 & -3 \end{pmatrix}$

(B) $\begin{pmatrix} -4 & 6 \\ -3 & -3 \end{pmatrix}$

(C) $\begin{pmatrix} 6 & -4 \\ -3 & 3 \end{pmatrix}$

(D) none of these

Q9 For any two matrices A and B, we have

(A) $AB = BA$

(B) $AB \neq BA$

(C) $AB = 0$

(D) None of these

Q10 In the question statements of Assertion (A) is followed by a statement of Reason (R). Choose the correct option.

Assertion (A): If two matrices $A = [a_{ij}]_{m\times n}$ and $B = [b_{ij}]_{n\times p}$ are given, then product AB is defined and is of $m \times p$ order.

Reason (R): Every square matrix can be expressed as a sum of symmetric and skew-symmetric matrix.

(A) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(B) Both assertion (A) and reason (R) are true, but reason (R) is not the correct explanation of assertion (A).

(C) Assertion (A) is true, but reason (R) is false.

(D) Assertion (A) is false, but reason (R) is true.

Q11 Assertion (A): The matrix $A = \begin{bmatrix} 3 & 0 & 9 \\ 0 & 5 & 7 \end{bmatrix}$ is a diagonal matrix.

Reason (R): If $A = [a_{ij}]_{m\times m}$, where $a_{ij} = 0$ if $i \neq j$, then A is called diagonal matrix.

(A) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(B) Both assertion (A) and reason (R) are true, but reason (R) is not the correct explanation of assertion (A).

(C) Assertion (A) is true, but reason (R) is false.

(D) Assertion (A) is false, but reason (R) is true.

Q12 If A = [a_{ij}] is a square matrix of order 2 such that $a_{ij} = \begin{cases} 1, \text{ when } i \neq j \\ 0, \text{ when } i = j \end{cases}$, then A^2 is

(A) $\begin{bmatrix} 1 & 0 \\ 1 & 0 \end{bmatrix}$ (B) $\begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}$

(C) $\begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}$ (D) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

Q13 Given that $A = \begin{bmatrix} \alpha & \beta \\ \gamma & -\alpha \end{bmatrix}$ and $A^2 = 3I$, then

(A) $1 + \alpha^2 + \beta\gamma = 0$

(B) $1 - \alpha^2 - \beta\gamma = 0$

(C) $3 - \alpha^2 - \beta\gamma = 0$

(D) $3 + \alpha^2 + \beta\gamma = 0$

Q14 Given that matrices ***A*** and ***B*** are of order 3 × ***n*** and ***m*** × 5 respectively, then the order of matrix ***C*** = 5***A*** + 3***B*** is

(A) 3 × 5 and ***m*** = ***n***

(B) 3 × 5

(C) 3 × 3

(D) 5 × 5

Q15 If $A = \begin{bmatrix} 1 & -1 & 0 \\ 2 & 3 & 4 \\ 0 & 1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 2 & -4 \\ -4 & 2 & -4 \\ 2 & -1 & 5 \end{bmatrix}$, then

(A) $A^{-1} = B$ (B) $A^{-1} = 6B$

(C) $B^{-1} = B$ (D) $B^{-1} = \frac{1}{6}A$

Q16 If $A = \begin{bmatrix} 3 & 2 \\ 1 & 1 \end{bmatrix}$, find the values of a and b such that $A^2 + Aa + bI = O$. Hence find A^{-1}.

Q17 If $X \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix} = \begin{bmatrix} -7 & -8 & -9 \\ 2 & 4 & 6 \end{bmatrix}$, then find the matrix X.

Q18 If A is a square matrix such that $A^2 = I$, then find the simplified value of $(A-I)^3 + (A+I)^3 - 7A$.

Q19 If $AB = BA$ for any two square matrices, prove by mathematical induction that $(AB)^n = A^n B^n$.

Q20 Three schools A, B and C organised a mela for collecting funds for helping the rehabilitation of flood victims. They sold hand-made fans, mats and plates from recycled material at cost of Rs. 25 , Rs. 100 and Rs. 50 each.

The number of articles sold are given below:

Article	School A	School B	School C
Hand-fans	40	25	35
Mats	50	40	50
Plates	20	30	40

Find the funds collected by each school separately by selling the above articles using matrices. Also find the total funds collected for the purpose.

Answer Key

Q1 (B)

Q2 (B)

Q3 (A)

Q4 (D)

Q5 (A)

Q6 (C)

Q7 (A)

Q8 (B)

Q9 (B)

Q10 (B)

Q11 (D)

Q12 (D)

Q13 (C)

Q14 (B)

Q15 (D)

Q16 $a = -4,\ b = 1$

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

Q17 $\begin{bmatrix} 1 & -2 \\ 2 & 0 \end{bmatrix}$

Q18 A

Q19 **Check the solution**

Q20 Funds collected by each school, i.e.,

School ***A***: Rs. 7,000

School ***B***: Rs. 6,125

School ***C***: Rs. 7,875

Total funds collected for the purpose = Rs. 21,000