MATRICES AND DETERMINANTS

Expected Learning Outcomes

Students should be able to

1. Understand various properties of matrices and determinants .

2. Learn how to find the inverse of a matrix and apply determinant calculations to real world problems .

Core Concept And Major Areas

Applies the properties of determinants and matrices to solve the real life problems .

MCQ

1. If A is a non-singular square matrix of order 3 such that $A^2 = 3A$, then value of $|A|$ is

(a) -3   (b) 3   (c) 9   (d) 27

2. If A is a square matrix of order 2 such that A (adj A) = 10 I , then $|adj A|$ is equal to

(a) 1   (b) 10   (c) 100   (d) 10 I

ASSERTION – REASON BASED QUESTIONS

1 . Assertion (A) : If $A = \begin{pmatrix} 1.1 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & -2 \end{pmatrix}$ and $B = \begin{pmatrix} 2 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 3 \end{pmatrix}$, then AB = BA

   Reason (R) : Multiplication of diagonal matrices of same order will be commutative .

2. Assertion (A) : If A, B and C are the matrices of order 3 x l , 2 x m and 3 x n respectively , then

   (CA + BA) is defined if n = 3 and m = 3 .

   Reason (R) : T he multiplication of two matrices A and B is defined if

   number of columns of A = number of rows of B

CASE STUDY QUESTIONS

1. On her birthday, Ish 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 number of children be x and the amount distributed by Ish to each child be Rs. y .

1. Express the above in form of equation in x and y .

2. Express the above equations in Matrix form .

3. If A is the coefficient matrix , then find A^{-1}.

OR

4. If the coefficient matrix A satisfy the following matrix equation $A^2 - kA + 20I = 0$, then find k .

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ANSWERS (MATRICES AND DETERMINANTS)

MCQ

1. (d) 27   [use $|k A| = k^n |A|$]

2. (b) 10   [Use A (adj A) = |A| I also $|adj A| = |A|^{n-1}$]

ASSERTION – REASON BASED QUESTIONS

1. Option (a) - Borh A and R are true and R is the correct explanation of A .

2. Option (d) -A is false but R is true .

CASE STUDY QUESTIONS

1. Total Money = xy

    If there were 8 children less , everyone would have got Rs. 10 more

    xy = (x - 8) (y + 10) → 5x - 4 y = 40

    if there were 16 children more , everyone would have got Rs . 10 less

    xy = (x + 16) (y - 10) → -5 x + 8 y = 80

2. $\begin{bmatrix} 5 & -4 \\ -5 & 8 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 40 \\ 80 \end{bmatrix}$

3. $A^{-1} = \dfrac{1}{20} \begin{bmatrix} 8 & 4 \\ 5 & 5 \end{bmatrix}$

    OR

3. $\begin{bmatrix} 84 & 52 \\ 65 & 45 \end{bmatrix} - \begin{bmatrix} 8k & 4k \\ 5k & 5k \end{bmatrix} + \begin{bmatrix} 20 & 0 \\ 0 & 20 \end{bmatrix} = 0$

Therefore , k = 13 .

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