NDA 1 2025

LIVE

MATHS

MATRICES & DETERMINANTS - 1

MCQS

NAVJYOTI SIR

10 Feb 2025 Live Classes Schedule

9:00AM	10 FEBRUARY 2025 DAILY DEFENCE UPDATES	DIVYANSHU SIR
10:00AM	10 FEBRUARY 2025 DAILY CURRENT AFFAIRS	RUBY MA'AM

SSB INTERVIEW LIVE CLASSES

9:30AM	OVERVIEW OF TAT & WAT	ANURADHA MA'AM

AFCAT 1 2025 LIVE CLASSES

3:00PM	STATIC GK - NATIONAL & INTL ORG & HQ	DIVYANSHU SIR
4:30PM	ENGLISH - FILL IN THE BLANKS - CLASS 2	ANURADHA MA'AM
5:30PM	MATHS - CLOCKS	NAVJYOTI SIR

NDA 1 2025 LIVE CLASSES

10:00AM	MATHS - MATRICES & DETERMINANTS - CLASS 1	NAVJYOTI SIR
11:30AM	POLITY - CLASS 3	RUBY MA'AM
1:00PM	BIOLOGY - CLASS 1	SHIVANGI MA'AM
4:30PM	ENGLISH - FILL IN THE BLANKS - CLASS 2	ANURADHA MA'AM

CDS 1 2025 LIVE CLASSES

11:30AM	POLITY - CLASS 3	RUBY MA'AM
1:00PM	BIOLOGY - CLASS 1	SHIVANGI MA'AM
4:30PM	ENGLISH - FILL IN THE BLANKS - CLASS 2	ANURADHA MA'AM

SSBCrack EXAMS

QUESTION

PYQ – 24 - I

Let A and B be matrices of order 3×3. If $|A| = \frac{1}{2\sqrt{2}}$ and $|B| = \frac{1}{729}$, then what is the value of $|2B(adj(3A))|$?

(a) 27

(b) $\frac{-27}{2\sqrt{2}}$

(c) $\frac{27}{2}$

(d) 1

$|2B| \times |adj(3A)|$

$2^3 |B| \times |3^3 adj(A)|$

$= 2^3 \times \frac{1}{729} \times (3^3 |A|)^{3-1}$

$|AB| = |A| . |B|$

$|kA| = k^n |A|$ n – order of A

$|adj A| = |A|^{n-1}$

$|adj(kA)| = k^{n(n-1)} |A|^{n-1}$

$= 8 \times \frac{1}{729} \times (27)^2 |A|^2 = 8 \times \frac{1}{729} \times 729 \times \frac{1}{8} = 1$

SSBCrack EXAMS

QUESTION

PYQ – 24 - I

. Consider the following statements in respect of two non-singular matrices A and B of the same order n :

1. $adj(AB) = (adjA)(adjB)$
2. $adj(AB) = adj(BA)$
3. $(AB)adj(AB) - |AB|I_n$ is a null matrix of order n

How many of the above statements are correct ?

(a) None

(b) Only one statement

(c) Only two statements

(d) All three statements

$adj(AB) = adj(B) \cdot adj(A)$

$A\,adj A = (adj A) A = |A| I_n$

I_n – identity matrix of order n.

Replace A by AB,

$(AB)\,adj(AB) - |AB| I_n = 0$ → null matrix

Q) Consider the following statements:

1. If det A= 0, then det (adj A) = 0
2. If A is non- singular, then $\det(A^{-1}) = (\det A)^{-1}$

(a) 1 only (b) 2 only

(c) Both 1 and 2 (d) Neither 1 nor 2

① $|adj A| = |A|^{n-1} = (0)^{n-1} = 0$

② $|A^{-1}| = |A|^{-1} = \frac{1}{A}$

Q) Consider the following statements:

1. If det A = 0, then det (adj A) = 0
2. If A is non- singular, then $\det(A^{-1}) = (\det A)^{-1}$

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

Ans: (c)

Q) If $l + m + n = 0$, then the system of equations

$$-2x + y + z = l$$
$$x - 2y + z = m$$
$$x + y - 2z = n$$

has

(a) a trivial solution (b) no solution

(c) a unique solution (d) infinitely many solutions

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

(A)

$$|A| = -2(4-1) - 1(-2-1) + 1(1+2)$$
$$= -6 + 3 + 3 = 0$$

② $(\text{adj} A) B$

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

(A)

$$(\text{adj} A)B = \begin{bmatrix} 3 & 3 & 3 \\ 3 & 3 & 3 \\ 3 & 3 & 3 \end{bmatrix} \begin{bmatrix} l \\ m \\ n \end{bmatrix} = \begin{bmatrix} 3(l+m+n) \\ 3(l+m+n) \\ 3(l+m+n) \end{bmatrix}_{3\times 1}$$

$(\text{adj} A)B = 0$ if $l+m+n = 0$ (given)

$\Rightarrow |A| = 0$ & $(\text{adj } A)B = 0$ (null matrix)

The given system of eqns have infinitely many solutions.

Q) If $l + m + n = 0$, then the system of equations

$$-2x + y + z = l$$
$$x - 2y + z = m$$
$$x + y - 2z = n$$

has

(a) a trivial solution
(b) no solution
(c) a unique solution
(d) infinitely many solutions

Ans: (d)

Q) Consider the following statements in respect of symmetric matrices A and B

1. AB is symmetric.
2. $A^2 + B^2$ is symmetric.

Which of the above statement(s) is/are correct?

(a) 1 only (b) 2 only

(c) Both 1 and 2 (d) Neither 1 nor 2

① $(AB)^T = B^T A^T = B \cdot A \neq AB$

② $(A^2 + B^2)^T = (A^2)^T + (B^2)^T$

$= (A^T)^2 + (B^T)^2 = A^2 + B^2$

Q) Consider the following statements in respect of symmetric matrices A and B

1. AB is symmetric.
2. $A^2 + B^2$ is symmetric.

Which of the above statement(s) is/are correct?

(a) 1 only (b) 2 only

(c) Both 1 and 2 (d) Neither 1 nor 2

Ans: (b)

Q) If $A = \begin{bmatrix} \omega & 0 \\ 0 & \omega \end{bmatrix}$, where ω is cube root of unity, then what is A^{100} equal to?

(a) A (b) $-A$

(c) Null matrix (d) Identity matrix

$$A^2 = \begin{bmatrix} \omega & 0 \\ 0 & \omega \end{bmatrix}\begin{bmatrix} \omega & 0 \\ 0 & \omega \end{bmatrix} = \begin{bmatrix} \omega^2 & 0 \\ 0 & \omega^2 \end{bmatrix}$$

$$A^3 = \begin{bmatrix} \omega^2 & 0 \\ 0 & \omega^2 \end{bmatrix}\begin{bmatrix} \omega & 0 \\ 0 & \omega \end{bmatrix} = \begin{bmatrix} \omega^3 & 0 \\ 0 & \omega^3 \end{bmatrix}$$

$(A^2 \cdot A)$

$$A^{100} = \begin{bmatrix} \omega^{100} & 0 \\ 0 & \omega^{100} \end{bmatrix}$$

$$= \begin{bmatrix} \omega^1 & 0 \\ 0 & \omega^1 \end{bmatrix} = A$$

$\omega^{3r} = 1$

$\omega^{3r+1} = \omega^1$

$\omega^{3r+2} = \omega^2$

Q) If $A = \begin{bmatrix} \omega & 0 \\ 0 & \omega \end{bmatrix}$, where ω is cube root of unity, then what is A^{100} equal to?

(a) A

(b) $-A$

(c) Null matrix

(d) Identity matrix

Ans: (a)

Q) A matrix X has $(a+b)$ rows and $(a+2)$ columns; and a matrix Y has $(b+1)$ rows and $(a+3)$ columns. If both XY and YX exist, then what are the values of a, b respectively?

(a) 3, 2 (b) 2, 3

(c) 2, 4 (d) 4, 3

$XY \Rightarrow$ no. of columns of X = no. of rows of Y

$a+2 = b+1 \Rightarrow \underline{b = a+1}$

$YX \Rightarrow$ no. of columns of Y = no. of rows of X

$a+3 = a+b \Rightarrow a+3 = a+(a+1) \Rightarrow a = 2$, $b = 3$

Q) A matrix X has $(a+b)$ rows and $(a+2)$ columns; and a matrix Y has $(b+1)$ rows and $(a+3)$ columns. If both XY and YX exist, then what are the values of a, b respectively?

(a) 3, 2 (b) 2, 3

(c) 2, 4 (d) 4, 3

Ans: (b)

Q) If $f(x)=\begin{vmatrix} 1+\sin^2 x & \cos^2 x & 4\sin 2x \\ \sin^2 x & 1+\cos^2 x & 4\sin 2x \\ \sin^2 x & \cos^2 x & 1+4\sin 2x \end{vmatrix}$

What is the maximum value of f(x) ?

(a) 2 (b) 4

(c) 6 (d) 8

$R_2 \rightarrow R_1 - R_2$; $R_3 \rightarrow R_1 - R_3$

$$f(x) = \begin{vmatrix} 1+\sin^2 x & \cos^2 x & 4\sin 2x \\ 1 & -1 & 0 \\ 1 & 0 & -1 \end{vmatrix} \Rightarrow f(x) = (1+\sin^2 x)(1) - \cos^2 x(-1) + 4\sin 2x\,(0+1)$$

$$f(x) = 1+\sin^2 x + \cos^2 x + 4\sin 2x$$

$$f(x) = 1 + \sin^2 x + \cos^2 x + 4\sin 2x$$

$$f(x) = 2 + 4\sin 2x$$

max. value when $\sin 2x = 1$

$$2 + 4(1) = 6$$

Q) If $f(x)=\begin{vmatrix} 1+\sin^2 x & \cos^2 x & 4\sin 2x \\ \sin^2 x & 1+\cos^2 x & 4\sin 2x \\ \sin^2 x & \cos^2 x & 1+4\sin 2x \end{vmatrix}$

What is the maximum value of $f(x)$?

(a) 2 (b) 4

(c) 6 (d) 8

Ans: (c)

Q) For a square matrix A, which of the following properties hold?

1. $(A^{-1})^{-1} = A$ ✓
2. $\det(A^{-1}) = \dfrac{1}{\det A}$
3. $(\lambda A)^{-1} = \lambda A^{-1}$, where λ is a scalar

Select the correct answer using the code given below.

(a) 1 and 2 (b) 2 and 3 (c) 1 and 3 (d) 1, 2 and 3

(2) $|A^{-1}| = |A|^{-1} = \dfrac{1}{|A|}$

(3)

Q) For a square matrix A, which of the following properties hold?

1. $(A^{-1})^{-1} = A$
2. $\det(A^{-1}) = \dfrac{1}{\det A}$
3. $(\lambda A)^{-1} = \lambda A^{-1}$, where λ is a scalar

Select the correct answer using the code given below.

(a) 1 and 2 (b) 2 and 3 (c) 1 and 3 (d) 1, 2 and 3

Ans: (d)

SSBCrack EXAMS

Q) The system of equations

$$2x + y - 3z = 5$$

$$3x - 2y + 2z = 5 \text{ and } 5x - 3y - z = 16$$

(a) is inconsistent
(b) is consistent, with a unique solution
(c) is consistent, with infinitely many solutions
(d) has its solution lying along X-axis in three-dimensional space

$$\begin{bmatrix} 2 & 1 & -3 \\ 3 & -2 & 2 \\ 5 & -3 & -1 \end{bmatrix} = A$$

unique solution

$$|A| = 2(2+6) - 1(-3-10) - 3(-9+10) = 16 + 13 - 3 = 26 \neq 0$$

Q) The system of equations

$$2x + y - 3z = 5$$

$$3x - 2y + 2z = 5 \text{ and } 5x - 3y - z = 16$$

(a) is inconsistent
(b) is consistent, with a unique solution
(c) is consistent, with infinitely many solutions
(d) has its solution lying along X-axis in three-dimensional space

Ans: (b)

Q) If $\Delta = \begin{vmatrix} a & b & c \\ d & e & f \\ g & h & i \end{vmatrix}$

then what is

$$\begin{vmatrix} 3d+5g & 4a+7g & 6g \\ 3e+5h & 4b+7h & 6h \\ 3f+5i & 4c+7i & 6i \end{vmatrix}$$ equal to?

(a) Δ

(b) 7Δ

(c) 72Δ

(d) -72Δ

Q) If $\Delta = \begin{vmatrix} a & b & c \\ d & e & f \\ g & h & i \end{vmatrix}$

then what is

$$\begin{vmatrix} 3d+5g & 4a+7g & 6g \\ 3e+5h & 4b+7h & 6h \\ 3f+5i & 4c+7i & 6i \end{vmatrix}$$ equal to?

(a) Δ (b) 7Δ

(c) 72Δ (d) -72Δ

Ans: (d)

Q) If $A = \begin{bmatrix} 1 & a \\ 0 & 1 \end{bmatrix}$,

where $a \in \mathbb{N}$, then what is $A^{100} - A^{50} - 2A^{25}$ equal to?

(a) $-2I$ (b) $-I$

(c) $2I$ (d) I

where I is the identity matrix.

Q) If $A = \begin{bmatrix} 1 & a \\ 0 & 1 \end{bmatrix}$,

where $a \in \mathbb{N}$, then what is $A^{100} - A^{50} - 2A^{25}$ equal to?

(a) $-2I$ (b) $-I$

(c) $2I$ (d) I

where I is the identity matrix.

Ans: (a)


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