MATRICES

Algebra Of Matrices

1. If $A = \begin{pmatrix} 2 & 3 & 1 \\ 1 & 3 & 2 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 2 \\ 2 & 1 \\ 1 & 3 \end{pmatrix}$, show that $AB \neq BA$.

2. If $A_\alpha = \begin{pmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{pmatrix}$, then find $A_\alpha A_\beta$.

PROBLEMS

1. If a,b,c and d are real numbers and $A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$,
prove that $A^2 - (a+d)A + (ab - bc)I = O$.

2. Show that the product of two upper or two lower triangular matrices is itself triangular.

OBJECTIVE

1. If A and B are any two square matrices of the same order, then
   a) $(AB)' = A'B'$ b) $adj(AB) = adj(A)adj(B)$
   c) $(AB)' = B'A'$ d) $AB=O$, $A=O$ or $B=O$

2. If $A = \begin{pmatrix} -2 & 3 & -1 \\ -1 & 2 & -1 \\ -6 & 9 & -4 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 3 & -1 \\ 2 & 2 & -1 \\ 3 & 0 & -1 \end{pmatrix}$, then
   a) $AB = BA$ b) $AB \neq BA$ c) $AB = 1/2\ BA$ d) none of these

EXERCISE – 1

Explain why in general (1 – 3):

1. $A^2 - B^2 \neq (A+B)(A-B)$.
2. $(A \pm B)^2 \neq A^2 + B^2 \pm 2AB$.
3. $A^3 \pm B^3 \neq (A \pm B)(A^2 \mp AB + B^2)$.
4. Let $f: S \to S$ be a function over the set S, where S is a set of all square matrices and $f(x) = x^2 - 5x + 6$, $\forall x \in S$. Find $f(A)$ if $A = \begin{pmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{pmatrix}$.
5. Prove that the product of the two matices $\begin{pmatrix} \cos^2\theta & \cos\theta\sin\theta \\ \cos\theta\sin\theta & \sin^2\theta \end{pmatrix}$ and $\begin{pmatrix} \cos^2\theta & \cos\theta\sin\theta \\ \cos\theta\sin\theta & \sin^2\theta \end{pmatrix}$ is a null matrix when θ and α differ by an odd multiple of $\pi/2$.
6. If $A = \begin{pmatrix} 0 & -\tan\theta/2 \\ \tan\theta/2 & 0 \end{pmatrix}$ and $I = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$, show that $I + A = (I - A)\begin{pmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{pmatrix}$
7. Evaluate the following:

a) $\left(\begin{pmatrix} 1 & 3 \\ -1 & -4 \end{pmatrix} + \begin{pmatrix} 3 & -2 \\ -1 & 1 \end{pmatrix}\right)\begin{pmatrix} 1 & 3 & 5 \\ 2 & 4 & 6 \end{pmatrix}$ (b) $\begin{pmatrix} 2 & 3 & 5 \end{pmatrix}\begin{pmatrix} 1 & 0 & 3 \\ 2 & 0 & 1 \\ 0 & 1 & 2 \end{pmatrix}\begin{pmatrix} 1 \\ 4 \\ 6 \end{pmatrix}$

8.Find 'x' if $\begin{pmatrix} x & 1 \end{pmatrix} \begin{pmatrix} 1 & 0 \\ -2 & -3 \end{pmatrix} \begin{pmatrix} x \\ 3 \end{pmatrix}=0$

9.Find x such that $\begin{pmatrix} 1 & x & 1 \end{pmatrix} \begin{pmatrix} 1 & 3 & 2 \\ 0 & 5 & 1 \\ 0 & 3 & 2 \end{pmatrix} \begin{pmatrix} 1 \\ 1 \\ x \end{pmatrix}=0$

10.If $A = \begin{pmatrix} 1 & -2 & 4 \\ 2 & 3 & 2 \\ 3 & 1 & 5 \end{pmatrix}$ and $B = \begin{pmatrix} 0 & -1 & 4 \\ 1 & 3 & 2 \\ -1 & 1 & 5 \end{pmatrix}$, then A+B is

a) $\begin{pmatrix} 1 & -2 & 4 \\ 3 & 3 & 2 \\ 2 & 1 & 5 \end{pmatrix}$ b) $\begin{pmatrix} 1 & -2 & 8 \\ 3 & 3 & 4 \\ 2 & 1 & 10 \end{pmatrix}$ c) $\begin{pmatrix} 1 & -4 & 8 \\ 3 & 6 & 4 \\ 2 & 2 & 10 \end{pmatrix}$

d) none of these

11.If $A^2 = 8A + KI$, where $A = \begin{pmatrix} 1 & 0 \\ -1 & 7 \end{pmatrix}$, then value of K is

a) 7 b) -7 c) 1 d) -1

Special Matrices

1. Suppose a,b,c are real numbers such that abc =1. If $A = \begin{pmatrix} a & b & c \\ b & c & a \\ c & a & b \end{pmatrix}$ is such that A'A=I, then find the value of $a^3+b^3+c^3$.

2.If $\omega \neq 1$ is a cube root of unity, then show that given matrix I ingula matix.

$$A = \begin{pmatrix} 1+2\omega^{100}+\omega^{200} & \omega^2 & 1 \\ 1 & 1+\omega^{100}+2\omega^{200} & \omega \\ \omega & \omega^2 & 2+\omega^{100}+2\omega^{200} \end{pmatrix}$$

3. Show that the matrix $\begin{pmatrix} 1 & 1 & 3 \\ 5 & 2 & 6 \\ -2 & -1 & -3 \end{pmatrix}$ is nilpotent matrix of index 3.

PROBLEM

1.Determine the value of α,β,γ when $\begin{pmatrix} 0 & 2\beta & \gamma \\ \alpha & \beta & -\gamma \\ \alpha & -\beta & \gamma \end{pmatrix}$ is orthogonal.

2. how that every square matrix A can be uniquely expressed as P + iQ where P and Q are Hermitian Matrices.

3.If A I Hermitian such that $A^2 = O$, show that A=O, where O is the zero matrix.

OBJECTIVE

1.For what value of x, the matrix $\begin{pmatrix} 3-x & 2 & 2 \\ 2 & 4-x & 1 \\ -2 & -4 & -1-x \end{pmatrix}$ is singular.

a) x=1,2 b) x=0,2 c) x=0,1 d) x=0,3.

EXERCISE – 2

1.show that every square matrix can be uniquely expressed as sum of a symmetric and skew symmetric matrix.

2.If B is a real m×n matrix, show that B'B as well as BB' is a symmetric matrix.

3.Find the symmetric and skew – symmetric part of the matrix $A = \begin{pmatrix} 1 & 2 & 4 \\ 6 & 8 & 1 \\ 3 & 5 & 7 \end{pmatrix}$.

4.If A, B,A+I and A+B are idempotent matrices show that AB = BA.

5.If A and B are two given square matrices then show that

a) B'AB is symmetric if A is symmetric.

b)B'AB I skew – symmetric if A is skew symmetric.

6.Show that the matrix $\begin{pmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{pmatrix}$ is orthogonal.

7.The matrix $\begin{pmatrix} \lambda & 7 & -2 \\ 4 & 1 & 3 \\ 2 & -1 & 2 \end{pmatrix}$ is a singular matrix if λ is

a) 2/5 b) 5/2 c) -5 d) none of these

8.If $f(x) = \begin{pmatrix} \cos x & -\sin x & 0 \\ \sin x & \cos x & 0 \\ 0 & 0 & 1 \end{pmatrix}$, then f(x+y) is equal to

a) f(x)+f(y) (b) f(x) – f(y) c) f(x) . f(y) d) none of these

9. If $A = \begin{pmatrix} \alpha & 0 \\ 1 & 1 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 0 \\ 5 & 1 \end{pmatrix}$ such that $A^2 = B$, then α is

a) 1 b) -1 c) 4 d) none of these

Elementary Transformations or Elementary Operations of a Matrix

1.Using elementary row transformations and find the inverse of the matrix

$A = \begin{pmatrix} 3 & -1 & -2 \\ 2 & 0 & -1 \\ 3 & -5 & 0 \end{pmatrix}$.

2.If the system of equations x+ay – z =0, 2x – y+az=0 and ax+y+2z =0 has a non – trivial solution, then find the value of 'a'.

3.Find the values of 'k' for which the system of equations (k+1) x + 8y = 4k, kx+(k+3)y=3k – 1 has no solution.

PROBLEMS

1. If $A = \begin{pmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{pmatrix}$, show that $A^2 - 4A - 5I = 0$ where I and 0 are the unit matrix and the null matrix of order 3 respectively .Use this result to find A^{-1}.

2.Solve the system of equations x+3y – 2z=0, 2x – y+4z=0, x – 11y+14z=0.

3.Discuss for all values of λ, the system of equation x+y+4z=6, x+2y – 2z=6, λx+y+z=6 as regards existence and nature of solutions.

OBJECTIVE

1.The adjoint of the matrix $A = \begin{pmatrix} 1 & 2 \\ 3 & -5 \end{pmatrix}$ is……………...

2.If $A = \begin{pmatrix} 2 & 5 & 3 \\ 3 & 1 & 2 \\ 1 & 2 & 1 \end{pmatrix}$, then A^{-1} I equal to……………...

3.With the help of matrices, the solution of the equations:

$3x+y+2z=3, \quad 2x-3y-z=-3, \quad x+2y+z=4$ is given by

a) x=1, y=2, z=-1 b)x= -1, y=2, z=1 c)x=1, y= -2, z= -1 d)x = -1, y=-2, z=1

4.If $A = \begin{pmatrix} 1 & tanx \\ -tanx & 1 \end{pmatrix}$, $x \neq (2n+1)\pi/2$, then the value of $[A^TA^{-1}]$ is

a) cos 4x b) sec^2x c) –cos 4x d)1

EXERCISE – 3

Solve the following equation by matrix method (1 – 2)

1.$x+y-2z=1$; $x-y+z=0$; $2x+3y-4z=2$,

2.$x+2y+3z+1=0$, $2x+y-z+5=0$, $3x+y-2z-3=0$.

3.If A is the matrix $\begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ p & q & r \end{pmatrix}$ and I is the unit matrix of order 3, then show that $A^3 = pI + qA + rA^2$.

4.Find the adjoint of the matrix $A = \begin{pmatrix} 1 & 2 & 3 \\ 1 & 3 & 5 \\ 1 & 5 & 12 \end{pmatrix}$ and hence, evaluate A^{-1}.

5.For the matrix $A = \begin{pmatrix} 1 & -1 & 1 \\ 2 & 3 & 0 \\ 18 & 2 & 10 \end{pmatrix}$, show that A (adjA) =0.

6.If $A = \begin{pmatrix} 0 & -4 & 1 \\ 2 & \lambda & -3 \\ 1 & 2 & -1 \end{pmatrix}$, then A^{-1} exists (i.e A is invertible) if

a) $\lambda \neq 4$ b) $\lambda \neq 8$ c) $\lambda = 4$ d) none of these

7.If $A = \begin{pmatrix} 1 & -1 & 1 \\ 1 & 2 & 0 \\ 1 & 3 & 0 \end{pmatrix}$, then the value of |adj A| is equal to

a) 5 b) 0 c) 1 d) none of these

8.If $A = \begin{pmatrix} sin\alpha & -cos\alpha & 0 \\ cos\alpha & sin\alpha & 0 \\ 0 & 0 & 1 \end{pmatrix}$, then A^{-1} iss equal to

a) A^T b) A c) adj A d) none of these

MISCELLANEOUS PROBLEMS

1.Find the possible square roots of the two rowed unit matrix I.

2. $A = \begin{pmatrix} a & 0 & 1 \\ 1 & c & b \\ 1 & d & b \end{pmatrix}$, $B = \begin{pmatrix} a & 1 & 1 \\ 0 & d & c \\ f & g & h \end{pmatrix}$, $U = \begin{pmatrix} f \\ g \\ h \end{pmatrix}$, $V = \begin{pmatrix} a^2 \\ 0 \\ 0 \end{pmatrix}$. If there is vector matrix X, such that AX =U has infinitely many solutions, then prove that BX =V cannot have a unique solution. If $afd \neq 0$ then prove that BX =V has no solution.

OBJECTIVE

1.If the trace of the matrix : $A = \begin{pmatrix} x-1 & 0 & 2 & 5 \\ 3 & x^2-2 & 4 & 1 \\ -1 & -2 & x-3 & 1 \\ 2 & 0 & 4 & x^2-6 \end{pmatrix}$ is 0 then x is equal to

a) (-2,3) b) (2, -3) c) (-3,2) d) (3,-2)

2.If A and B are square matrices of order 3, then

a) $adj(AB) = adjA + adjB$ b) $(A+B)^{-1} = A^{-1} + B^{-1}$

c) $AB = O \rightarrow |A| = 0$ or $|B| = 0$ d) $AB = O \rightarrow |A| = 0$ and $|B| = 0$

3.The system AX=B of n equations in n unknown has infinitely many solution if

a) $\det A \neq 0$ b) $\det A = 0$, $(adj\ A)B \neq O$

c) $\det A = 0$, $(adj\ A)B = O$ d) $\det A \neq 0$, $(adj A)B = O$

ASSIGNMENT

1.If $D = diag\ (a_1, a_2, a_3, \ldots\ldots a_n)$, where $a_i \neq 0\ \forall\ i = 1,2,\ldots\ldots n$, then show that $D^{-1} = diag\ (a_1^{-1}, a_2^{-1}, \ldots\ldots a_n^{-1})$.

2.Find the inverse of the matrix

$$A = \begin{pmatrix} a+ib & c+id \\ -c+id & a-ib \end{pmatrix} \text{ if } a^2+b^2+c^2+d^2 = 1.$$

3.(i) If A is a non – singular square matrix, then prove that $adj(adj(A)) = |A|^{n-2} A$.

(ii)If A is a Hermitian matrix, then prove that adjA is also Hermitian.

4.If matrix $A = \begin{pmatrix} a & b & c \\ b & c & a \\ c & a & b \end{pmatrix}$ where a,b,c are real numbers and $A^T A = I$, then find the value of a+b+c.

5.Solve the following system of homogeneous equations:

$2x+3y-z=0$; $x-y-2z=0$; $3x+y+3z=0$.

6.If A be a square matrix then show that adj A' = (adj A)'.

7.If A is a diagonal matrix with diagonal elements all different, prove that AB = BA if and only if B is a diagonal matrix.

8. Find the inverse of $\begin{pmatrix} 5 & 2 & -6 \\ 7 & -3 & 4 \\ 3 & 5 & -12 \end{pmatrix}$ by using elementary row operations.

9.Show that the equations $-2x+y+z=a$, $x-2y+z=b$, $x+y-2z=c$ have no solutions unless $a+b+c=0$, in which case , t hey have infinitely many solutions.

10.Investigate for what values of λ, μ the equations

$X+y+z=6$; $x+2y+3z=10$, $x+2y+\lambda z = \mu$ have…

(i) no solutions,

(ii) unique solutions,

(iii) infinitely many solutions.

11. Let $A = [a_{ij}]$, where $a_{ij}\ u_i v_j\ \forall\ 1 \leq i \leq n, 1 \leq j \leq n$ and $u_i, v_j \in \mathcal{R}$ satisfies $A^2 = 16A$, find tr (A).

12.Show that the matrix $A = \begin{pmatrix} ab & b^2 \\ -a^2 & -ab \end{pmatrix}$ is nilpotent. Also find the index of nilpotency.

13.Show that the system of equations

$3x - y+4z=3$; $x+2y - 3z = -2$; $6x+5y+\lambda z= -3$

Has at least one solution for all real λ. Find the set of solutions if $\lambda = -5$.

14.The square matrix A is an involutory. If a square matrix P is such that $P^2=P$, then show that $A = 2P - I$ is involutory and $B = 1/2(A+1)$ satisfies the condition $B^2=B$.

PART – B
(Multi Choice Single Correct)

1. $\begin{pmatrix} 7 & 1 & 2 \\ 9 & 2 & 1 \end{pmatrix} \begin{pmatrix} 3 \\ 4 \\ 5 \end{pmatrix} + 2\begin{pmatrix} 4 \\ 2 \end{pmatrix}$ is equal to

a) $\frac{43}{44}$ b) $\frac{43}{45}$ c) $\frac{45}{44}$ d) none of these

2. If $A = \begin{pmatrix} a & 0 & 0 \\ 0 & a & 0 \\ 0 & 0 & a \end{pmatrix}$, then |A| |Adj A| is equal to

a) a^{25} b) a^{27} c) a^{81} d) none of these

3.If a matrix A is symmetric as well as knew symmetric then A is a

a) diagonal matrix b) null matrix c) unit matrix d) none of these

4.If $A = \begin{pmatrix} \alpha & 0 \\ 0 & 1 \end{pmatrix}$ and $B = \begin{pmatrix} 16 & 0 \\ 0 & 1 \end{pmatrix}$ then the value of α for which $A^2=B$ is

a) 1 b) -1 c)4 d) none of these

5.If $A = \begin{pmatrix} 0 & 0 & 0 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{pmatrix}$, then

a) $A^2=A$ b) $A^2=0$ c) $A^2=I$ d) $A^3=O$

6.If $A = \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 1 & 0 \end{pmatrix}$, then A is

a) an invertible matrix b) an idempotent matrix c) a nilpotent matrix
d) none of theseof tjhese

7.If A and B are symmetric matrices of the same order, then

a) AB is a symmetric matrix b) A – B is skew – symmetric matrix
c) AB+BA is a symmetric matrix d) AB – BA is a symmetric matrix

8.If A is any square matrix, then

a) A+A’ is skew symmetric b) A – A’ is symmetric c) AA’ is symmetric
d) none of these

9.If A is a square matrix such that $A^3=I$ then A^{-1} is equal to

a) I b) A c) A^2 d) none of these

10.If A is any square matrix then which of the following is not symmetric?

a) A+A’ b) A – A’ c) AA’ d) A’A

11. Let A be a skew – symmetric matrix of order n. Then

a) $|A| = 0$ if n is even b) $|A| = 0$ if n is odd c) $|A| = 0$ for all $n \in N$

d) none of these

12.Each diagonal element of a skew – symmetric matrix is

a) zero   b) positive   c) non – real   d) negative

13.If A = $\begin{pmatrix} 4 & 2 \\ -1 & 1 \end{pmatrix}$, then the value of (A – 2I)(A – 3I) is

a) unit matrix   b) Non – singular matrix   c) Null matrix   d)None of these

14.If A =$\begin{pmatrix} i & 0 \\ 0 & i \end{pmatrix}$, n∈N then A^{4n} is

a)$\begin{pmatrix} 0 & i \\ i & 0 \end{pmatrix}$ b)$\begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$ c)$\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ d)$\begin{pmatrix} i & 0 \\ 0 & i \end{pmatrix}$

15. If A =$\begin{pmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{pmatrix}$, then A^{-1} is equal to

a)$\begin{pmatrix} 7 & -3 & -3 \\ 0 & 1 & 0 \\ -1 & 0 & 5 \end{pmatrix}$ b)$\begin{pmatrix} 7 & -3 & -3 \\ -1 & 1 & 0 \\ -1 & 0 & 1 \end{pmatrix}$ c)$\begin{pmatrix} 7 & -3 & -3 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{pmatrix}$

d) none of these

16.If A and B matrices commute then

a) A^{-1} and B also commute   b) B^{-1} and A also commute

c) A^{-1} and B^{-1} also commute   d) all the above

17. If A, B, C are three matrices conformable for multiplication then $(ABC)^{-1}$ is equal to

a) $A^{-1}B^{-1}C^{-1}$ b)$B^{-1}C^{-1}A^{1}$ c)$C^{-1}B^{-1}A^{-1}$ d) can not said

18.If A =$\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ a & b & -1 \end{pmatrix}$, then A^2 is equal to

a) unit matrix   b) null matrix   c) A   d) –A

19.Trace of a skew symmetric matrix is always

a) negative   b) positive   c) zero   d) none of these

20. If A = $\begin{matrix} \alpha & 2 \\ 2 & \alpha \end{matrix}$ and $|A^3|$=125 then the value of α is

a) ± 1 b) ± 2 c) ± 3 d) ± 5

(Multi Choice Multi Correct)

1. Let α = π/5 and A =$\begin{pmatrix} cos\alpha & sin\alpha \\ -sin\alpha & cos\alpha \end{pmatrix}$, then B = $A^4 - A^3 + A^2 - A$ is

a) singular   b) non – singular   c) symmetric   d) |B| =1

2.If A =$\begin{matrix} \alpha & \beta \\ 0 & \alpha \end{matrix}$ is the n^{th} root of I_2, then choose the correct statement

a)If n is odd, α=1 , β =0   b) if n is odd, α = -1, β =0

c) If n is even, α=1,β=0   d)If n is even, α=-1, β=0

3.If matrix A = $\begin{pmatrix} a & b & c \\ b & c & a \\ c & a & b \end{pmatrix}$, where a,b,c are real numbrs, abc =1 and A^TA =I, then which of the following may be true

a) a+b+c =1   b) $a^2+b^2+c^2=1$ c) ab+bc+ca=0   d) $a^3+b^3+c^3=4$

NUMERICAL BASED TYPE

1.If A and B are two non – singular matrices of the same order such that $B^r=I$, for some positive integer r>1. Then $A^{-1}B^{r-1}A - A^{-1}B^{-1}A$ is equal to

2.For any matrix A of order 2×2, if A(adjA) = $\begin{pmatrix} 7 & 0 \\ 0 & 7 \end{pmatrix}$, then |A| is equal to?

LINKED COMPREHNSION TYPE

Read the following write up carefully and answer the following questions:

A = $\begin{pmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 3 & 2 & 1 \end{pmatrix}$, If U_1,U_2 and U_3 ar columns matrices satisfying.

$AU_1 = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$, $AU_2 = \begin{pmatrix} 2 \\ 3 \\ 0 \end{pmatrix}$, $AU_3 = \begin{pmatrix} 2 \\ 3 \\ 1 \end{pmatrix}$ and U is 3×3 matrix whose columns are U_1,U_2, U_3 then answer the following questions

1.The value of |U| is

a) 3   b) -3   c) 3/2   d) 2

2.The sum of the elements of U^{-1} is

a) -1   b) 0   c) 1   d) 3

3.The value of $\begin{pmatrix} 3 & 2 & 0 \end{pmatrix}$ U $\begin{pmatrix} 3 \\ 2 \\ 0 \end{pmatrix}$ is

a) 5   b) 5/2   c) 4   d) 3/2

MATRIX – MATCH TYPE

Each question contains statements given in two columns which have to be matched. Statements (A,B,C,D) in column I have to be matched with statements (p,q,r,s) in column II.

1.If A is non – singular matrix of order n×n, then

Column – I	Column – II
A) $(\text{adj } A)^{-1}$ =	p) k^{n-1} (adj A)
B) $\text{adj}(A^{-1})$ =	q) A /|A|
C) adj (kA) =	r) $\|A\|^{n-2}$ A
D) adj (adj A)=	s) $\dfrac{\text{adj (adjA)}}{\|A\|^{n-1}}$

SECTION – II
(Multi Choice Single Correct)

1.If A' is the transpose of a square matrix A, then

a) |A| ≠ |A'| b) |A| = |A'| c) |A| + |A'| =0

d) |A| = |A'| only when A is symmetric

2.If I = $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$, J = $\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$ and B = $\begin{pmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{pmatrix}$, then B equals

a) I cosθ + J sinθ b) I sinθ+J cosθ c) I cosθ – J sinθ d) –I cosθ+ J sinθ

3. If I_n is the identity matrix of order n, then $(I_n)^{-1}$

a) does not exist b) not equal to I_n c) equal to I_n d) none of these

4.If for a matrix A,A^2+I =O where I is the identity matrix, then A equals

a) $\begin{bmatrix}1 & 0\\0 & 1\end{bmatrix}$ b) $\begin{bmatrix}i & 0\\0 & -i\end{bmatrix}$ c) $\begin{bmatrix}1 & 2\\-1 & 1\end{bmatrix}$ d) $\begin{bmatrix}-1 & 0\\- & -1\end{bmatrix}$

5.If A and B are square matrices of the same order and A is non – singular then for a positive integer n, $(A^{-1}BA)n$ is equal to

a) $A^{-1}B^nA$ b) $n(A^{-1}BA)$ c) $A^{-n}B^nA^n$ d) none of these

6.If A and B are symmetric matrices of order n (A≠B), then

a) A+B is skew symmetric b) A+B is symmetric c) A+B is a diagonal matrix d) A+B is a zero matrix

7.If A = $\begin{bmatrix}0 & c & -b\\-c & 0 & a\\b & -a & 0\end{bmatrix}$ and

B= $\begin{bmatrix}a^2 & ab & ac\\ab & b^2 & bc\\ac & bc & c^2\end{bmatrix}$ then AB=?

a) A^3 b) B_2 c) O d) I

8.If A is a non – diagonal invalutory matrix, then

a) A – I is non – zero singular b) A+I=0 c) A – I =0 d) none of these

9. Th values of x for which the matrix $\begin{bmatrix}x+a & b & c\\a & x+b & c\\a & b & x+c\end{bmatrix}$ is non – singular are

a) R – {0} b) R – {-(a+b+c)} c) R – {0,-(a+b+c)} d) none of these

10.If A = $\begin{matrix}2 & 3\\5 & -2\end{matrix}$, then $19A^{-1}$ is equal to

a) A’ b) 2A c) 1/2A d) A