MATHS

BOOKS - MTG WBJEE MATHS (HINGLISH)

MATRICES AND DETERMINANTS

Wb Jee Workout Category 1 Single Option Correct Type

1. Value of determinant $\begin{vmatrix} 0 & b & -c \\ -b & 0 & a \\ c & -a & 0 \end{vmatrix}$ is equal to

A. a + b + c

B. abc

C. $a^2+b^2+c^2$

D. 0

Answer: D

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2. For what values of a and b the system of equations

2 x + ay + 6 z = 8

x+2y+bz=5

x + y + 3 z = 4 , has a unique solution ?

A. a = 2 , b = 3

B. $a \neq 2, b \neq 3$

C. a = - 2, b = - 3

D. None of these

Answer: B

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3. The value of λ for which the homogeneous system of equations possesses a non-trivial solution

$x + \lambda y + 2z = 0$

$3x + 2\lambda y + z = 0$ is

$2x + 3y - 4z = 0$

A. 0

B. 15

C. $\frac{15}{2}$

D. $-\frac{15}{2}$

Answer: C

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4. If x, y, z are in A.P., then the value of

$\begin{vmatrix} p+2 & p+3 & p+4 \\ p+3 & p+4 & p+5 \\ p+2x & p+2y & p+2z \end{vmatrix}$ equals to

A. 4a

B. 0

C. 4a

D. 1

Answer: B

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5. $\Delta = \begin{vmatrix} a & 4-i & 1-i \\ 4+i & b & 3+i \\ 1-i & 3-i & c \end{vmatrix}$ is always

A. purely real

B. purely imaginary

C. zero

D. None of these

Answer: A

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6. From the matrix equation AB=AC, we conclude B=C provided.

A. A is singular

B. A is square

C. A is skew symmetric

D. A is non-singular

Answer: D

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7. If $\Delta = \begin{vmatrix} \sin x & \sin(x+h) & \sin(x+2h) \\ \sin(x+2h) & \sin x & \sin(x+h) \\ \sin(x+h) & \sin(x+2h) & \sin x \end{vmatrix}$

find $\lim_{h \to 0} \left(\frac{\Delta}{h^2}\right)$.

A. 6 sin x $\cos^2$ x

B. 6 cos x $\sin^2$ x

C. 9 sin x $\cos^2$ x

D. 9 cos x $\sin^2$ x

Answer: C

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8. If $A^2 - A + I = 0$, then the inverse of the matrix A is

A. A - I

B. I - A

C. A+ I

D. A

Answer: B

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9. If the matrices A = $\begin{bmatrix} 2 & 1 & 3 \\ 4 & 1 & 0 \end{bmatrix}$ and B = $\begin{bmatrix} 1 & -1 \\ 0 & 2 \\ 5 & 0 \end{bmatrix}$, then $(AB)^T$ will be

A. $\begin{bmatrix} 17 & 0 \\ 4 & -2 \end{bmatrix}$

B. $\begin{bmatrix} 4 & 0 \\ 0 & 4 \end{bmatrix}$

C. $\begin{bmatrix} 17 & 4 \\ 0 & -2 \end{bmatrix}$

D. $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

Answer: C

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10. If A and B are two matrices such that $A + B$ and AB are both defined, then

A. A and B can be any matrices

B. A, B are square matrices not necessarily of the same order

C. A, B are square matrices of the same order

D. number of columns of A = number of rows of B

Answer: C

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11. If A = $\begin{bmatrix} 2 & x-2 \\ 2x+3 & x-3 \end{bmatrix}$ is a symmetric matrix, then the value of x is

A. 4

B. 3

C. -5

D. -3

Answer: C

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12. The value of $\begin{vmatrix} a-b & b-c & c-a \\ b-c & c-a & a-b \\ c-a & a-b & b-c \end{vmatrix}$ =

A. 0

B. -1

C. 1

D. 2

Answer: A

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13. If p = $\begin{bmatrix} 1 & 2 & 1 \\ 1 & 3 & 1 \end{bmatrix}$, Q = pp', then the value of the determinant of Q is equal to

A. 2

B. -2

C. 1

D. 0

Answer: A

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14. The values of x, y, z and w such that

$$\begin{bmatrix} x-y & 2z+w \\ 2x-y & 2x+w \end{bmatrix} = \begin{bmatrix} 6 & 4 \\ 12 & 15 \end{bmatrix}$$ are

A. x = 6 , y = 0 , z = 1/2 , w = 3

B. x = 2 , y = 7, z = 1 , w = 1

C. x = 7 , y = 2 , z = -1, w = 2

D. x = - 7, y = 2, , w = 1

Answer: A

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15. If X + Y = $\begin{bmatrix} 7 & 0 \\ 2 & 5 \end{bmatrix}$ and X - Y = $\begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix}$, then

A. $X = \begin{bmatrix} 5 & 0 \\ 1 & 4 \end{bmatrix}, Y = \begin{bmatrix} 2 & 0 \\ 0 & 1 \end{bmatrix}$

B. $X = \begin{bmatrix} 5 & 0 \\ 1 & 4 \end{bmatrix}, Y = \begin{bmatrix} 2 & 0 \\ 1 & 1 \end{bmatrix}$

C. $X = \begin{bmatrix} 2 & 1 \\ 1 & 0 \end{bmatrix}, Y = \begin{bmatrix} 1 & 2 \\ 4 & 3 \end{bmatrix}$

D. $X = \begin{bmatrix} 5 & 4 \\ 1 & 0 \end{bmatrix}, Y = \begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}$

Answer: B

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16. If $2\begin{bmatrix} 3 & 4 \\ 5 & x \end{bmatrix} + \begin{bmatrix} 1 & y \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 7 & 0 \\ 10 & 5 \end{bmatrix}$, then values of x and y are

A. x = 0 , y = 1

B. x = - 2 , y = 8

C. x = - 1, y = 8

D. x = 2, y= - 8

Answer: D

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17. If $\begin{bmatrix} 1 & 5 \\ 3 & 4 \end{bmatrix}\begin{bmatrix} 3 & 1 \\ 3 & 5 \end{bmatrix} = \begin{bmatrix} 18 & 26 \\ k & 23 \end{bmatrix}$, then the value of k is

A. 21

B. 13

C. 28

D. 12

Answer: A

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

A. a null matrix

B. a unit matrix

C. $-A$

D. A

Answer: B

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19. If A = $\begin{bmatrix} 5 & x \\ y & 0 \end{bmatrix}$ and A = A', then

A. x = 0 , y = 5

B. x + y = 5

C. x = y

D. None of these

Answer: C

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20. The trace of the matrix A = $\begin{bmatrix} 1 & -5 & 7 \\ 0 & 7 & 9 \\ 11 & 8 & 9 \end{bmatrix}$ is

A. 17

B. 25

C. 3

D. 12

Answer: A

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21. If A = $\begin{bmatrix} 1 \\ -4 \\ 3 \end{bmatrix}$ and B = [-1, 2, 1], then (AB)' is equal to

A. $\begin{bmatrix} -1 & 4 & -3 \\ 2 & -8 & 6 \\ 1 & -4 & 3 \end{bmatrix}$

B. $\begin{bmatrix} -1 & 2 & 1 \\ 4 & -8 & -4 \\ -3 & 6 & 3 \end{bmatrix}$

C. $\begin{bmatrix} 1 & 4 & -3 \\ 2 & -8 & 6 \\ 1 & 4 & 3 \end{bmatrix}$

D. $\begin{bmatrix} -1 & 4 & -3 \\ 2 & 8 & 6 \\ 1 & -4 & 3 \end{bmatrix}$

Answer: A

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22. If A = $\left[a_{ij}\right]_{2\times 2}$, where $a_{ij}=\dfrac{(i+2j)^2}{2}$, then A is equal to

A. $\begin{bmatrix} 9 & 25 \\ 8 & 18 \end{bmatrix}$

B. $\begin{bmatrix} 9/2 & 25/2 \\ 8 & 18 \end{bmatrix}$

C. $\begin{bmatrix} 9 & 25 \\ 4 & 9 \end{bmatrix}$

D. $\begin{bmatrix} 9/2 & 15/2 \\ 4 & 9 \end{bmatrix}$

Answer: B

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23. [1 x 1] $\begin{bmatrix} 1 & 3 & 2 \\ 2 & 5 & 1 \\ 15 & 3 & 2 \end{bmatrix}\begin{bmatrix} 1 \\ 2 \\ x \end{bmatrix}$ = 0, if x =

A. -7

B. -11

C. -2

D. 14

Answer: C

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24. Let $A = \begin{bmatrix} a & 0 & 0 \\ 0 & a & 0 \\ 0 & 0 & a \end{bmatrix}$, then A^n is equal to

A. $\begin{bmatrix} a^n & 0 & 0 \\ 0 & a^n & 0 \\ 0 & 0 & a \end{bmatrix}$

B. $\begin{bmatrix} a^n & 0 & 0 \\ 0 & a & 0 \\ 0 & 0 & a \end{bmatrix}$

C. $\begin{bmatrix} a^n & 0 & 0 \\ 0 & a^n & 0 \\ 0 & 0 & a^n \end{bmatrix}$

D. $\begin{bmatrix} a^n & 0 & 0 \\ 0 & na & 0 \\ 0 & 0 & na \end{bmatrix}$

Answer: C

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25. If matrix $A = ([a_{ij}])_{2 \times 2}$, where $a_{ij} = \{1, \quad \text{if} \quad i \neq j0, \quad \text{if} \quad i + j$,

then A^2 is equal to I (b) A (c) O (d) I

A. I

B. A

C. O

D. $-I$

Answer: A

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26. If $\begin{bmatrix} x - y & 4 \\ z + 6 & x + y \end{bmatrix} = \begin{bmatrix} 8 & w \\ 0 & 0 \end{bmatrix}$, then the value of (x + y + w + z) is

A. 0

B. 2

C. 1

D. -2

Answer: D

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27. If matrix $\begin{bmatrix} 0 & a & 3 \\ 2 & b & -1 \\ c & 1 & 0 \end{bmatrix}$ is skew-symmetric matrix, then find the values of a,b and c,

A. $-2, \ -3, 0$

B. $-2, 3, 0$

C. $-2, 0, \ -3$

D. 0, - 3, - 2

Answer: C

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28. Under what conditions is the matrix $A^2 - B^2 = (A - B)(A + B)$ is true?

A. AB = BA

B. A = - A'

C. B = - B'

D. AB = - BA

Answer: A

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29. Let F (x) = $\begin{bmatrix} \cos x & -\sin x & 0 \\ \sin x & \cos x & 0 \\ 0 & 0 & 1 \end{bmatrix}$, then

A. F (x). F(y) = F (x + y)

B. F(x)F(y) = F (x). F (y)

C. F(x) . F (y) = F(x - y)

D. F(x) . F(y) = F(y - x)

Answer: A

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30. If $A = \begin{bmatrix} \alpha & 0 \\ 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 5 & 1 \end{bmatrix}$ then value of α for which $A^2 = B$, is

A. ± 2

B. 4

C. $\pm$ 4

D. None of these

Answer: D

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Wb Jee Workout Category 2 Single Option Correct Type

1. The matrix A = $\begin{bmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{bmatrix}$ is

A. Nilpotent

B. Idempotent

C. Orthogonal

D. Involutary

Answer: B

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2. If A = $\begin{bmatrix} -qr & p(q+r) & pr+pq \\ pq+qr & -pr & pq+qr \\ qr+pr & qr+pr & -pq \end{bmatrix}$, then |A| equals

A. $\left(\sum pq\right)^2$

B. $\left(\sum p^2q^2\right)^2$

C. $\left(\sum (qr)\right)^3$

D. $\left(\sum pq\right)^3$

Answer: D

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3. If $\begin{vmatrix} b+c & b & c \\ a & c+a & c \\ a & b & a+b \end{vmatrix}$ = k(a.b.c), then the value of k equals

A. 0

B. 2

C. 4

D. -4

Answer: C

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4. If $\begin{vmatrix} x & 2 & 3 \\ 2 & 3 & x \\ 3 & x & 2 \end{vmatrix} = \begin{vmatrix} 1 & x & 4 \\ x & 4 & 1 \\ 4 & 1 & x \end{vmatrix} = \begin{vmatrix} 0 & 5 & x \\ 5 & x & 0 \\ x & 0 & 5 \end{vmatrix}$ = 0, then the value x equals (x $\in$ R)

A. 0

B. 5

C. -5

D. None of these

Answer: C

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5. Let t be a positive integer and $\begin{vmatrix} (2t-1) & m^2-1 & \cos^2(m) \\ mC_t & 2^m & \cos^2(m) \\ 1 & m+1 & \cos(m^2) \end{vmatrix}$ then the value of $\sum_{t=0}^{m} \Delta_t$ is equal to

A. 2^m

B. 0

C. $2^m \cos^2(2^m)$

D. m^2

Answer: B

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6. If A = $\begin{bmatrix} i & 0 \\ 0 & i \end{bmatrix}$ and B = $\begin{bmatrix} 0 & -i \\ -i & 0 \end{bmatrix}$, then (A + B)(A - B) equals

A. $A^2 + B^2$

B. $A^2 - B^2$

C. $A^2 + 2AB + B^2$

D. None of these

Answer: B

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7. If A = $\begin{bmatrix} 0 & 3 \\ 4 & 5 \end{bmatrix}$ and kA = $\begin{bmatrix} 0 & 4a \\ 3b & 60 \end{bmatrix}$, then value of k , a and b are respectively

A. 12,19,16

B. 9, 12 , 16

C. 12, 9, 16

D. 16, 9, 12

Answer: C

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8. If $A = \begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$, then $A^{-1} =$

A. $-\frac{1}{9}$A

B. $\frac{1}{9}$ A

C. $\frac{1}{19}$A

D. $-\frac{1}{19}A$

Answer: C

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9. The system of equations ax + y + z = 0 , -x + ay + z = 0 and - x - y + az = 0 has a non-zero solution if the real value of 'a' is

A. 1

B. -1

C. 3

D. 0

Answer: D

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10. The values of λ and μ for which the system of equations $x + y + z = 6\ x + 2y + 3z = 10\ x + 2y + \lambda z = \mu$ have unique solution are

$(A)\lambda \neq 3, \mu \in R, (B)\lambda = 3, \mu = 10, (C)\lambda \neq 3, \mu = 10, (D)\lambda \neq 3, \mu \neq 10$

A. $\lambda \neq 3, \mu \in$ R

B. $\lambda = 3, \mu = 10$

C. $\lambda = 3\mu \neq 10$

D. $\lambda \neq 3, \mu \not\neq$ R

Answer: A

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11. The value of x for which the matrix $\begin{vmatrix} -x & x & 2 \\ 2 & x & -x \\ x & -2 & -x \end{vmatrix}$ will be non-singular, are

A. $-2 \leq x \leq 2$

B. for all x other than 2 and - 2

C. $x \geq 2$

D. $x \leq \ -2$

Answer: B

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12. If the matrix A = $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ is commutative on product with the matrix B = $\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$, then

A. a = 0, b = c

B. b = 0 , c = d

C. c = 0 , d = a

D. d = 0 , a = b

Answer: C

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13. If A is a square matrix, then

A. A + A^t is symmetric

B. AA^t is skew-symmetric

C. $A^t + A$ is skew-symmetric

D. A^tA is skew-symmetric

Answer: A

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14. If A and B are square matrices of the same order and $AB = 3I$, then $A^{-1} =$

A. 3B

B. $\frac{1}{3}$ B

C. $3B^{-1}$

D. $\frac{1}{3}B^{-1}$

Answer: B

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15. If ω is an imaginary cube root of unity and $\begin{vmatrix} x+\omega^2 & \omega & 1 \\ \omega & \omega^2 & 1+x \\ 1 & x+\omega & \omega^2 \end{vmatrix}$ = 0 , then one of the values of x is

A. 1

B. 0

C. -1

D. 2

Answer: B

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Wb Jee Workout Category 3 One Or More Than One Option Correct Type

1. If A = $\begin{bmatrix}1 & 2 \\ -4 & -1\end{bmatrix}$, then A^{-1} is

A. $\frac{1}{7}\begin{bmatrix}-1 & 2 \\ 4 & 1\end{bmatrix}$

B. $\frac{1}{7}\begin{bmatrix}1 & 2 \\ 4- & -1\end{bmatrix}$

C. $\frac{1}{7}\begin{bmatrix}-1 & -2 \\ 4 & 1\end{bmatrix}$

D. Does not exist

Answer: C

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2. If z = $\begin{vmatrix}1 & 1+2i & -5i \\ 1-2i & -3 & 5+3i \\ 5i & 5-3i & 7\end{vmatrix}$, then $(i = \sqrt{-1})$

A. z is purely real

B. z is purely imaginary

C. z + $\bar{z}$ = 0

D. $(z - \bar{z})$ i is purely imaginary

Answer: A

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3. If one of the cube roots of 1 be ω, then $\begin{vmatrix} 1 & 1+\omega^2 & \omega^2 \\ 1-i & -1 & \omega^2-1 \\ -i & -1+\omega & -1 \end{vmatrix}$ (A) ω

(B) i (C) 1 (D) 0

A. ω

B. i

C. 1

D. 0

Answer: D

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4. The number of real values of α for which the system of equations

$x + 3y + 5z = \alpha x$

$5x + y + 3z = \alpha y$

$3x + 5y + z = \alpha z$

has infinite number of solutions is

A. 1

B. 2

C. 4

D. 6

Answer: A

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5. The system of linear equations

$\lambda x + y + z = 3$

x - y - 2z = 6

$-x + y + z = \mu$ has

A. infinite number of solutions for $\lambda \neq -1$ and all μ

B. infinite number of solutions for λ = -1 and μ = 3

C. no solution for $\lambda \neq -1$

D. unique solution for λ = -1 and μ = 3

Answer: B

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6. Let A = $\begin{bmatrix} 0 & 2b & c \\ a & b & -c \\ a & -b & c \end{bmatrix}$ be an orthogonal matrix, then the values of a, b, c, are related with

A. $b = \pm \frac{1}{\sqrt{6}}, c = \pm \frac{1}{\sqrt{3}}$

B. $a = \pm \frac{1}{\sqrt{2}}, c = \pm \frac{1}{\sqrt{3}}$

C. $a = \pm \frac{1}{\sqrt{2}}, b = \pm \frac{1}{\sqrt{6}}$

D. All of these

Answer: D

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7. The symmetric part of the matrix $A = \begin{bmatrix} 1 & 2 & 4 \\ 6 & 8 & 2 \\ 2 & -2 & 7 \end{bmatrix}$ is equal to

A. $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 8 & 0 \\ 3 & 0 & 7 \end{bmatrix}$

B. $\begin{bmatrix} 1 & 4 & 3 \\ 4 & 8 & 0 \\ 3 & 0 & 7 \end{bmatrix}$

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

D. $\begin{bmatrix} -1 & -2 & -3 \\ -2 & 8 & 0 \\ -3 & 0 & 7 \end{bmatrix}$

Answer: B

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8. If a,b,c be respectively the p^{th}, q^{th} and r^{th} terms of a H.P., then

$\Delta = \begin{vmatrix} bc & ca & ab \\ p & q & r \\ 1 & 1 & 1 \end{vmatrix}$ equals

A. -1

B. a + b + c

C. p + q + r

D. None of these

Answer: D

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9. If maximum and minimum values of the determinant $\begin{vmatrix} 1+\cos^2 x & \sin^2 x & \cos 2x \\ \cos^2 x & 1+\sin^2 x & \cos 2x \\ \cos^2 x & \sin^2 x & 1+\cos 2x \end{vmatrix}$ are α and β then

A. $\alpha^2 + \beta^{101} = 10$

B. $\alpha^3 - \beta^{99} = 26$

C. $2\alpha^2 - 18\beta^{11} = 0$

D. $\alpha^3 + 2\beta^2 = 0$

Answer: A::B::C

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10. If A = $\begin{bmatrix} (b+c)^2 & a^2 & a^2 \\ b^2 & (c+a)^2 & b^2 \\ c^2 & c^2 & (a+b)^2 \end{vmatrix}$, then det A is

A. $2(a+b+c)^2$

B. 2abc $(a+b+c)^2$

C. 2 abc $(a+b+c)^3$

D. abc $(a+b+c)^2$

Answer: C

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11. If AB = A and BA = B, then

A. $A^2 = A$

B. $B^2 = B$

C. $A^2 = -A$

D. $B^2 = -B$

Answer: A::B

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12. If A and B are symmetric matrices of the same order then (A) A-B is skew symmetric (B) A+B is symmetric (C) AB-BA is skew symmetric (D) AB+BA is symmetric

A. A + B is a symmetric matrix

B. AB - BA is a skew-symmetric matirx

C. AB + BA is a symmetric matrix

D. $AB^t + BA^t$ is a symmetric matrix

Answer: A::B::C::D

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13. If $A_\alpha, = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$, then

A. $(A_\alpha)^n = \begin{bmatrix} -\cos n\alpha & \cos n\alpha \\ -\sin n\alpha & \sin n\alpha \end{bmatrix}$

B. $A_\alpha A_\beta = A_{\alpha+\beta}$

C. $(A_\alpha)^n = \begin{bmatrix} -\cos n\alpha & \sin n\alpha \\ -\sin n\alpha & \cos n\alpha \end{bmatrix}$

D. $A_\alpha A_\beta = -A_{\alpha+\beta}$

Answer: B::C

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14. If I= $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, $J = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$ then $\text{B} =$

A. I cos $\theta + J\sin\theta$

B. $I\sin(\pi/2+\theta)+J\cos\theta$

C. $I\cos\theta - J\sin(\pi+\theta)$

D. $-I\cos\theta + J\sin\theta$

Answer: A::C

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15. If the elements of a matrix A are real positive and distinct such that det $\left(A + A^T\right)^T = 0$ then

A. det A $>$ 0

B. det A $\geq$ 0

C. det $\left(A - A^t\right) > 0$

D. det $\left(AA^t\right) > 0$

Answer: A::C::D

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Wb Jee Previous Years Questions Category 1 Single Option Correct Type

1. Let I = $\begin{bmatrix}1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1\end{bmatrix}$ and $P = \begin{bmatrix}1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & -2\end{bmatrix}$. Then the matrix $p^3 + 2P^2$ is equal to

A. P

B. I-P

C. 2I + P

D. 2I - P

Answer: C

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2. The value of the determinant

$$\begin{vmatrix} 1+a^2-b^2 & 2ab & -2b \\ 2ab & 1-a^2+b^2 & 2a \\ 2b & -2a & 1-a^2-b^2 \end{vmatrix}$$ is equal to

A. 0

B. $(1+a^2+b^2)$

C. $(1+a^2+b^2)^2$

D. $(1+a^2+b^2)^3$

Answer: D

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3. Let Q = $\begin{bmatrix} \cos\frac{\pi}{4} & -\sin\frac{\pi}{4} \\ \sin\frac{\pi}{4} & \cos\frac{\pi}{4} \end{bmatrix}$ and $x = \begin{bmatrix} \frac{2}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} \end{bmatrix}$ then Q^3 x is equal to

A. $\begin{bmatrix} 0 \\ 1 \end{bmatrix}$

B. $\begin{bmatrix} -\frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} \end{bmatrix}$

C. $\begin{bmatrix} -1 \\ 0 \end{bmatrix}$

D. $\begin{bmatrix} -\frac{1}{\sqrt{2}} \\ -\frac{1}{\sqrt{2}} \end{bmatrix}$

Answer: C

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4. If $n \geq 2$ is an integer $A = \begin{bmatrix} \cos\left(2\frac{\pi}{n}\right) & \sin\left(2\frac{\pi}{n}\right) & 0 \\ -\sin\left(2\frac{\pi}{n}\right) & \cos\left(2\frac{\pi}{n}\right) & 0 \\ 0 & 0 & 1 \end{bmatrix}$ and I is the identity matrix of order 3. Then 1) $A^n = I$ and $A^{n-1} \neq 1$ 2) $A^m \neq I$ for any positive integer m 3) Ais not invertible 4) $A^m = 0$ for a positive integer m

A. $A^n = I$ and $A^{n-1} \neq I$

B. $A^m \neq I$ for any positive integer m

C. A is not invertibe

D. A^m = 0 for a positive integer m

Answer: A

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5. Let I denote the 3×3 identity matrix and P be a matrix obtained by rearranging the columns of I. then

A. there are six distinct choices for P and det (P) = 1

B. there are six distinct choices for P and det (P) = $\pm$ 1

C. there are more than one choice for P and some of them are not invertible

D. there are more than one choice for P and P^{-1} = I in each choice

Answer: B

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6. Let f(x) = $2x^2+5x+1$. If we write $f(x)$ as $f(x)=a(x+1)(x-2)+b(x-2)(x-1)+c(x-1)(x+1)$ for real numbers a , b, c then

A. there are infinite number of choices for a , b, c

B. only one choice for a but infinite number of choices for b and c

C. exactly one choice for each of a, b, c

D. more than one but finite number of choices for a,b, c

Answer: C

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7. The value of λ, such that the following system of equations has no solution, is

x - 2y + z = - 4

2x - y - 2z = 2

x + y + λz = 4

A. 3

B. I

C. 0

D. -3

Answer: D

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8. If f(x) = $\begin{vmatrix} 1 & x & x+1 \\ 2x & x(x-1) & (x+1)x \\ 3x(x-1) & x(x-1)(x-2) & (x+1)x(x-1) \end{vmatrix}$

Then f (100) is equal to

A. 0

B. 1

C. 100

D. 10

Answer: A

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9. If A and B are two matrices such that AB=B and BA=A , then $A^2 + B^2 =$

A. 2 AB

B. 2BA

C. A + B

D. AB

Answer: C

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10. The number of distinct real roots of $\begin{vmatrix} \sin x & \cos x & \cos x \\ \cos x & \sin x & \cos x \\ \cos x & \cos x & \sin x \end{vmatrix} = 0$ in the interval $-\frac{\pi}{4} \leq x \leq t\frac{\pi}{4}$ is

A. 0

B. 2

C. 1

D. > 2

Answer: C

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11. If $\omega$is an imaginary cube root of unity, then the value of the determinant $\begin{vmatrix} 1+\omega & \omega^2 & -\omega \\ 1+\omega^2 & \omega & -\omega^2 \\ \omega+\omega^2 & \omega & -\omega^2 \end{vmatrix}$

A. -2ω

B. $-3\omega^2$

C. -1

D. 0

Answer: B

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12. If x , y and z be greater than 1, then the value of

$$\begin{vmatrix} 1 & \log_x y & \log_x z \\ \log_y x & 1 & \log_y z \\ \log_z x & \log_z y & 1 \end{vmatrix} =$$

A. log x.logy.logz

B. logx + logy + logz

C. 0

D. 1 - {(logx).(logy).(logz)}

Answer: C

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13. If A is a 3x3 matrix and B is its adjoint matrix the determinant of B is 64 then determinant of A is

A. ± 2

B. ± 4

C. ± 8

D. ± 12

Answer: C

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14. The linear system of equations $8x - 3y - 5z = 0, 5x - 8y + 3z = 0 \text{ and } 3x + 5y - 8z = 0$

A. only zero solution

B. only finite number of non-zero solutions

C. no non-zero solution

D. infinitely many non-zero solutions

Answer: D

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15. Let A = $\begin{bmatrix} x+2 & 3x \\ 3 & x+2 \end{bmatrix}, B = \begin{bmatrix} x & 0 \\ 5 & x+2 \end{bmatrix}$. Then all solutions of the equation det (AB) = 0 is

A. 1, - 1, 0, 2

B. 1, 4, 0, -2

C. 1, - 1, 4, 3

D. $-1, 4, 0, 3$

Answer: B

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16. The value of det A, where $A = \begin{pmatrix} 1 & \cos\theta & 0 \\ -\cos\theta & 1 & \cos\theta \\ -1 & -\cos\theta & 1 \end{pmatrix}$ lies

A. in the closed interval [1 , 2]

B. in the closed interval [0,1]

C. in the open interval (0, 1)

D. in the open interval (1, 2)

Answer: A

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17. If $\begin{vmatrix} -1 & 7 & 0 \\ 2 & 1 & -3 \\ 3 & 4 & 1 \end{vmatrix}$ = A, then $\begin{vmatrix} 13 & -11 & 5 \\ -7 & -1 & 25 \\ -21 & -3 & -15 \end{vmatrix}$ is

A. A^2

B. $A^2 - A + I_3$

C. $A^2 - 3A + I_3$

D. $3A^2 + 5A - 4I_3$

Answer: A

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18. If $a^r = (\cos 2r\pi + I \sin 2r\pi)^{1/9}$, then the value of $\begin{vmatrix} a_1 & a_2 & a_3 \\ a_4 & a_5 & a^6 \\ a_7 & a_8 & a_9 \end{vmatrix}$ is

A. 1

B. -1

C. 0

D. 2

Answer: C

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19. If $S_r = \begin{vmatrix} 2r & x & n(n+1) \\ 6r^2 - 1 & y & n^2(2n+3) \\ 4r^3 - 2nr & z & n^3(n+1) \end{vmatrix}$ then $\sum_{r=1}^{n} S_r$ does not depend on-

A. x only

B. y only

C. n only

D. x, y, z and n

Answer: D

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20. If the following three linear equations have a non-trivial solution , then

x + 4ay + az = 0

x + 3by + bz = 0

x + 2cy + cz = 0

A. a , b, c are in A.P.

B. a, b, c are in G.P.

C. a, b, c are in H.P.

D. a + b + c = 0

Answer: C

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21. Let A be a square matrix of order 3 whose all entries are 1 and let I_3 be the indentiy matrix of order 3. then the matrix A - $3I_3$ is

A. invertible

B. orthogonal

C. non-invertible

D. real skew symmetric matrix

Answer: C

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22. If M is any sauare matrix of order 3 over R and if M' be the transpose of M, then adj (M') - (adj M)' is equal to

A. M

B. M'

C. null matrix

D. identity matrix

Answer: C

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23. If A = $\begin{pmatrix} 5 & 5x & x \\ 0 & x & 5x \\ 0 & 0 & 5 \end{pmatrix}$ and $|A^2| = 25$, then |x| is equal to

A. $\frac{1}{5}$

B. 5

C. 5^2

D. 1

Answer: A

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24. Let A and B be two square matrices of order 3 and AB = O_3 , where O_3 denotes the null matrix of order 3. then

A. must be A = $O_3 B = O_3$

B. If A $\neq O_3,$ must be B $\neq O_3$

C. If A = O_3 , must be B $\neq O_3$

D. may be A $\neq O_3, B \neq O_3$

Answer: D

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Wb Jee Previous Years Questions Category 2 Single Option Correct Type

1. If P = $\begin{bmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{bmatrix}$, then P^5 equals

A. P

B. 2P

C. $-P$

D. $-2P$

Answer: A

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2. For a matrix , A $= \begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 3 & 2 & 1 \end{bmatrix}$, if U_1, U_2 and U_3 are 3×1 column matrices satisfying

$AU_1 = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$, $AU_2 = \begin{bmatrix} 2 \\ 3 \\ 0 \end{bmatrix}$, $AU_3 = \begin{bmatrix} 2 \\ 3 \\ 1 \end{bmatrix}$ and U is a 3×3 matrix whose columns are U_1, U_2 and U_3 . then sum of the element of U^{-1} is

A. 6

B. 0

C. 1

D. 2 / 3

Answer: B

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3. If the matrix $A = \begin{bmatrix} 2 & 0 & 2 \\ 0 & 2 & 0 \\ 2 & 0 & 02 \end{bmatrix}$ then $A^n = \begin{bmatrix} a & 0 & 0 \\ 0 & a & 0 \\ b & 0 & a \end{bmatrix}$, $n \in N$ where

A. a = 2n , $b = 2^n$

B. a = 2^n, b = 2n

C. $a=2^n, b=n2^{n-1}$

D. $a=2^n, b=2n^n$

Answer: D

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4. Let A = $\begin{bmatrix}1 & 1 & 1\\ 0 & 1 & 1\\ 0 & 0 & 1\end{bmatrix}$. Then for positive ineger n, A^n is

A. $\begin{bmatrix}1 & n & n^2\\ 0 & n^2 & n\\ 0 & 0 & n\end{bmatrix}$

B. $\begin{bmatrix}1 & n & n\frac{n+1}{2}\\ 0 & 1 & n\\ 0 & 0 & 1\end{bmatrix}$

C. $\begin{bmatrix}1 & n^2 & n\\ 0 & n & n^2\\ 0 & 0 & n^2\end{bmatrix}$

D. $\begin{bmatrix}1 & n & 2n-1\\ 0 & \frac{n+1}{2} & n^2\\ 0 & 0 & \frac{n+1}{2}\end{bmatrix}$

Answer: B

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5. Let a , b, c be such that b (a + c) $\neq$ 0.

If $\begin{vmatrix} a & a+1 & a-1 \\ -b & b+1 & b-1 \\ c & c-1 & c+1 \end{vmatrix} + \begin{vmatrix} a+1 & b+1 & c-1 \\ a-1 & b-1 & c+1 \\ (-1)^{n+2}a & (-1)^{n+1}b & (-1)^{n}c \end{vmatrix} = 0,$

then the value of n is

A. any integer

B. zero

C. any even integer

D. any odd integer

Answer: D

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6. The least positive integer n such that $\begin{bmatrix} \cos\frac{\pi}{4} & \sin\frac{\pi}{4} \\ -\sin\frac{\pi}{4} & \cos\frac{\pi}{4} \end{bmatrix}^{n}$

is an identity matrix of order 2 is

A. 4

B. 8

C. 12

D. 16

Answer: B

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7. If the polynomial

$$f(x) = \begin{vmatrix} (1+x)^a & (2+x)^b & 1 \\ 1 & (1+x)^a & (2+x)^b \\ (2+x)^b & 1 & (1+x)^a \end{vmatrix}$$

then the constant term of f(x) is

A. 2 - $3.2^b + 2^{3b}$

B. $2 + 3.2^b + 2^{3b}$

C. $2 + 3.2^b - 2^{3b}$

D. $2 - 3.2^b - 2^{3b}$

Answer: A

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8. The system of equations

$\lambda x + y + 3z = 0, 2x + \mu y - z = 0, 5x + 7y + z = 0$

has infinitely many solutions in R. Then,

A. $\lambda = 2, \mu = 3$

B. $\lambda = 1, \mu = 2$

C. $\lambda = 1, \mu = 3$

D. $\lambda = 3, \mu = 1$

Answer: C

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Wb Jee Previous Years Questions Category 3 One Or More Than One Option Correct Type

1. Consider the system of equations :

x + y + z = 0

$\alpha x + \beta y + \gamma z = 0$

$\alpha^2 x + \beta^2 y + \gamma^2 z = 0$

then the system of equations has

A. a unique solution for all values of α, β, γ

B. infinite number of solutions if any two of α, β, γ are equal

C. a unique solution if α, β, γ are distinct

D. more than one,but finite number of solutions depending on values of α, β, γ

Answer: B::C

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2. In a third order matrix A, a_{ij} denotes the element in the i^{th} row and j^{th} column.

If $a_{ij} = \begin{cases} 0 & \text{for I} = j \\ 1 & \text{for I} > j \\ -1 & \text{for I} < j \end{cases}$

then the matrix is

A. skew-symmetric

B. symmetric

C. not invertible

D. non- singular

Answer: A::C

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3. Let A = $\begin{bmatrix} 3 & 0 & 3 \\ 0 & 3 & 0 \\ 3 & 0 & 3 \end{bmatrix}$. Then the roots of the equation det $(A - \lambda I_3) = 0$ (where I_3 is the identity matrix of order 3) are

A. 3, 0 , 3

B. 0, 3, 6

C. 1, 0 , - 6

D. 3, 3, 6

Answer: B

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