

For all questions, E. None of the Above means none of the above answers is correct.

1. Find the element $A_{(3,4)}$ when $A = \begin{bmatrix} 3 & 10 & 0 & 6 \\ 4 & 1 & -2 & -1 \\ 7 & 4 & 11 & 1 \\ 9 & -3 & 3 & 4 \end{bmatrix}$.

- a) -2 b) 1 c) 3 d) 4 e) NOTA

2. Multiply the matrices: $\begin{bmatrix} 1 & 2 \\ 5 & 4 \end{bmatrix} \begin{bmatrix} 2 & 1 & 0 & 4 \\ 1 & 6 & 1 & 2 \end{bmatrix}$.

a) $\begin{bmatrix} 4 & 13 & 2 & 8 \\ 14 & 15 & 4 & 28 \end{bmatrix}$ b) $\begin{bmatrix} 2 & 2 & 0 & 4 \\ 5 & 30 & 5 & 10 \end{bmatrix}$ c) $\begin{bmatrix} 4 & 13 & 2 & 8 \\ 14 & 29 & 4 & 28 \end{bmatrix}$ d) $\begin{bmatrix} 6 & 3 & 0 & 12 \\ 9 & 54 & 9 & 18 \end{bmatrix}$ e) NOTA

3. Find the area of the triangle with vertices $(1,5)$, $(-2,2)$ and $(6,-1)$.

- a) 15 b) 16.5 c) 31.5 d) 48 e) NOTA

4. Find the transpose of the following matrix: $A = \begin{bmatrix} 3 & -8 & 7 \\ 4 & 1 & -2 \\ 4 & 2 & 1 \end{bmatrix}$.

a) $\begin{bmatrix} 3 & -8 & 7 \\ 4 & 1 & -2 \\ 4 & 2 & 1 \end{bmatrix}$ b) $\begin{bmatrix} 4 & 2 & -1 \\ 4 & 1 & -2 \\ 3 & -8 & 7 \end{bmatrix}$ c) $\begin{bmatrix} 3 & 4 & 4 \\ -8 & 1 & 2 \\ 7 & -2 & 1 \end{bmatrix}$ d) $\begin{bmatrix} -7 & -2 & -3 \\ 2 & -1 & -4 \\ -1 & 8 & -4 \end{bmatrix}$ e) NOTA

5. Find the sum of x, y, z and t such that $\begin{bmatrix} x+y & 2z+t \\ x-y & z-t \end{bmatrix} = \begin{bmatrix} 3 & 7 \\ 1 & 5 \end{bmatrix}$.

- a) 5 b) 6 c) 8 d) 10 e) NOTA

6. Find the trace of $\mathbf{A}+\mathbf{B}$ when $\mathbf{A} = \begin{bmatrix} 1 & 2 & 3 \\ -4 & -4 & -4 \\ 5 & 6 & 7 \end{bmatrix}$ and $\mathbf{B} = \begin{bmatrix} 2 & -5 & 1 \\ 0 & 3 & -2 \\ 1 & 2 & -4 \end{bmatrix}$.

- a) 1 b) 4 c) 5 d) 6 e) NOTA

7. Find the product of x , y and z such that \mathbf{A} is symmetric where $\mathbf{A} = \begin{bmatrix} 2 & x & 3 \\ 4 & 5 & y \\ z & 1 & 7 \end{bmatrix}$.

- a) 8 b) 12 c) 14 d) 70 e) NOTA

8. For what value(s) of x does the inverse of matrix $\mathbf{A} = \begin{bmatrix} x^2 & x+6 \\ 4 & 4 \end{bmatrix}$ not exist?

- a) 4, 2 b) 3, -2 c) 2, -3 d) -4, -2 e) NOTA

9. A triangle with an area of three units has vertices (1, 2) (3,1) and (x, y) is a point on the line $y = 4x + 1$. If $x < 0$ find the value of $x + y$.

- a) $-\frac{2}{3}$ b) $-\frac{1}{3}$ c) $\frac{2}{3}$ d) 6 e) NOTA

10. Choose the adjoint of matrix \mathbf{M} if $\mathbf{M} = \begin{bmatrix} 47 & -5 \\ 29 & -3 \end{bmatrix}$.

- a) $\begin{bmatrix} -3 & 29 \\ -5 & 47 \end{bmatrix}$ b) $\begin{bmatrix} -3 & 5 \\ -29 & 47 \end{bmatrix}$ c) $\begin{bmatrix} 47 & 29 \\ -5 & -3 \end{bmatrix}$ d) $\begin{bmatrix} -5 & 47 \\ -3 & 29 \end{bmatrix}$ e) NOTA

11. Find the inverse of $\mathbf{A} = \begin{bmatrix} 2 & 1 \\ 4 & 0 \end{bmatrix}$ if it exists.

- a) $\begin{bmatrix} 0 & \frac{1}{4} \\ 1 & -\frac{1}{2} \end{bmatrix}$ b) $\begin{bmatrix} 0 & -\frac{1}{4} \\ 4 & 2 \end{bmatrix}$ c) $\begin{bmatrix} -\frac{1}{2} & -\frac{1}{4} \\ -1 & 0 \end{bmatrix}$ d) $\begin{bmatrix} \frac{1}{2} & \frac{1}{4} \\ 1 & 0 \end{bmatrix}$ e) NOTA

12. Find the coordinates of the image with vertices $(-1, -4)$, $(-2, 0)$, $(-4, 0)$, $(-6, -3)$, and $(-2, -4)$ after a rotation of 270° counterclockwise using the origin as the center of rotation.

- a) $(1, 4)$, $(2, 0)$, $(4, 0)$, $(6, 3)$, $(2, 4)$
- b) $(4, -1)$, $(0, -2)$, $(0, -4)$, $(3, -6)$, $(4, -2)$
- c) $(-6, 4)$, $(-2, 0)$, $(-4, 0)$, $(0, 4)$, $(-5, 3)$
- d) $(-4, 1)$, $(0, 2)$, $(0, 4)$, $(-3, 6)$, $(-4, 2)$
- e) NOTA

13. Use Cramer’s Rule to solve for z in the following system of equations.

$$-3x - 5y + 10z = -4$$

$$-8x + 2y - 3z = -91$$

$$6x + 8y - 7z = -35$$

- a) $\frac{-118}{7}$
- b) $\frac{-41}{7}$
- c) $\frac{66}{7}$
- d) $\frac{41}{7}$
- e) NOTA

14. What is the solution to the matrix equation $\begin{bmatrix} 3 & -1 \\ -1 & 2 \end{bmatrix} \begin{bmatrix} a \\ b \end{bmatrix} = \begin{bmatrix} 7 \\ -9 \end{bmatrix}$?

- a) $a = 7, b = -9$
- b) $a = 2, b = 1$
- c) $a = \frac{7}{3}, b = \frac{-9}{2}$
- d) $a = 1, b = -4$
- e) NOTA

15. Using the system $\begin{cases} 2x - 3y + z = 6 \\ x + 2y - 4z = 5 \\ -3x - 2y + 3z = -5 \end{cases}$ what is the determinant of the coefficient matrix?

- a) -150
- b) -27
- c) 6
- d) 29
- e) NOTA

16. Which is the solution to the system represented by $\begin{bmatrix} 2 & 0 & | & 5 \\ 0 & 3 & | & -3 \end{bmatrix}$?

- a) $(5, -3)$
- b) $(2.5, -3)$
- c) $(2.5, -1)$
- d) $(5, -1)$
- e) NOTA

17. Which matrix represents a dependent system of equations?

- a) $\begin{bmatrix} 1 & 0 & | & 1 \\ 0 & 1 & | & 1 \end{bmatrix}$
- b) $\begin{bmatrix} 4 & 5 & | & 7 \\ 0 & 0 & | & \frac{2}{3} \end{bmatrix}$
- c) $\begin{bmatrix} 4 & 5 & | & 7 \\ 0 & 0 & | & 0 \end{bmatrix}$
- d) $\begin{bmatrix} 1 & 0 & | & 0 \\ 0 & 1 & | & 0 \end{bmatrix}$
- e) NOTA

18. Which operation **cannot** be used to solve a system of equations by using an augmented matrix and row reduction?

- a) Multiply two rows together. b) Switch two rows.
 c) Subtract one row from another. d) Multiply a row by a constant e) NOTA

19. If $\mathbf{D} = \begin{bmatrix} 5 & 1 \\ 8 & 3 \\ 6 & 2 \end{bmatrix}$ and $\mathbf{E} = \begin{bmatrix} 0 & -5 \\ 1 & 4 \\ -2 & 3 \end{bmatrix}$, which of the following operations gives $\begin{bmatrix} 5 & 11 \\ 6 & -5 \\ 10 & -4 \end{bmatrix}$?

- a) $\mathbf{D} + 2\mathbf{E}$ b) $\mathbf{D} - 2\mathbf{E}$ c) $2\mathbf{D} + \mathbf{E}$ d) $2\mathbf{D} - \mathbf{E}$ e) NOTA

20. Solve for x and y $\begin{bmatrix} 5 & -1 \\ 2 & 3 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 7 \\ -1 \end{bmatrix}$.

- a) $\left(-\frac{19}{17}, \frac{20}{17}\right)$ b) $\left(\frac{20}{17}, -\frac{19}{17}\right)$ c) $\left(-\frac{20}{13}, \frac{19}{13}\right)$ d) $\left(\frac{19}{13}, -\frac{20}{13}\right)$ e) NOTA

21. Find AB if $\mathbf{A} = \begin{bmatrix} 4 & 7 \\ 5 & 3 \\ 2 & -1 \end{bmatrix}$ and $\mathbf{B} = \begin{bmatrix} 6 & 8 \\ 3 & -6 \end{bmatrix}$ if possible.

- a) not possible b) $\begin{bmatrix} 45 & -10 \\ 39 & 22 \\ 9 & 22 \end{bmatrix}$ c) $\begin{bmatrix} 69 & -30 \\ 54 & -3 \\ 4 & 12 \end{bmatrix}$ d) $\begin{bmatrix} -45 & 10 \\ -39 & -22 \\ -9 & -22 \end{bmatrix}$ e) NOTA

22. Evaluate $\begin{vmatrix} 1 & x & x^2 \\ 1 & y & y^2 \\ 1 & z & z^2 \end{vmatrix}$.

- a) $(x - y)(y - z)(z - x)$ b) $(x - y)(y - z)(x + z)$
 c) $xy^2 - x^2y + z^3$ d) $-x^2y + xy^2 + yz^2 + zy^2 + xz^2 - zx^2$ e) NOTA

23. Let $A = \begin{bmatrix} -1 & 0 \\ 2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -1 \\ 0 & 2 \end{bmatrix}$. Find $(A+B)(A-B)$.

- a) $\begin{bmatrix} 0 & 3 \\ 0 & -3 \end{bmatrix}$ b) $\begin{bmatrix} 0 & -1 \\ 4 & 5 \end{bmatrix}$ c) $\begin{bmatrix} -2 & 1 \\ 2 & -1 \end{bmatrix}$ d) $\begin{bmatrix} 3 & 0 \\ -3 & 0 \end{bmatrix}$ e) NOTA

24. Find the integral zero of the expression given by the determinant $\begin{vmatrix} x & 1 & -2 \\ -2 & x+1 & 1 \\ -1 & 3 & x-6 \end{vmatrix}$.

- a) -1 b) 0 c) 2 d) 5 e) NOTA

25. Find x given $\begin{bmatrix} \log_5 x & 3 \\ 2 & 1 \end{bmatrix} \begin{bmatrix} -2 \\ -1 \end{bmatrix} = \begin{bmatrix} -7 \\ -5 \end{bmatrix}$.

- a) 2 b) 5 c) 10 d) 25 e) NOTA

26. Given $A = \det \begin{bmatrix} i & \sqrt{-9} \\ 2i & -10i \end{bmatrix}$ and $B = \det \left(\begin{bmatrix} 2 & 10 \\ 8 & -4 \end{bmatrix} + \begin{bmatrix} 2 & 6 \\ -2 & 8 \end{bmatrix} \right)$ find $A - B$.

- a) -128 b) -96 c) 64 d) 96 e) NOTA

27. Polygon ABCD with vertices A(3,2), B(2,-2), C(-3,1) and D(-2,5) is rotated 90 degrees counterclockwise about the origin and then reflected over the line $y=x$. What is the x-coordinate of the final image of A?

- a) 1 b) 2 c) 3 d) 4 e) NOTA

28. Let $x =$ the units digit of the following sum: $1! + 2! + 3! + 4! + \dots + n! + \dots + 100!$

Evaluate $2^x + \begin{vmatrix} 4 & x \\ 2 & 5 \end{vmatrix} + {}_5C_x$.

- a) 14 b) 24 c) 32 d) 64 e) NOTA

29. Find the sum of all integral values of x that satisfy the following inequality:

$$\det \begin{bmatrix} x^2 & x \\ 11 & 1 \end{bmatrix} + \det \begin{bmatrix} x & 5 \\ -1 & x \end{bmatrix} < 0$$

- a) 5 b) 8 c) 10 d) 11 e) NOTA

30. If r is the radius of the circle defined by the equation $x^2 + y^2 - 4x + 2y - 20 = 0$, find the value of the following determinant:

$$\begin{vmatrix} r & 0 & 1 \\ r & 1 & 2 \\ 2 & 3 & 4 \end{vmatrix}.$$

- a) 3 b) 5 c) 20 d) 23 e) NOTA