**CPP-04**
**SS JEE(M) &**
**ADVANCED**

# Mathematics

Chapterwise Practise Problems (CPP) for JEE (Main & Advanced)

## Chapter - Matrices and Determinants

Level-1

### SECTION - A

**Straight Objective Type**

This section contains multiple choice questions. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** is correct.

1. If $TrA$ is trace of matrix $A = \begin{bmatrix} 2 & 1 & 2 \\ -1 & 4 & 7 \\ 0 & 3 & 2 \end{bmatrix}$ then value of $\sin^{-1}(\sin(TrA))$ is

(A) $8 - 2\pi$ (B) $8 - 3\pi$
(C) $3\pi - 8$ (D) $2\pi - 8$

2. A matrix $B$ satisfies the relation $B^2 = 3B - 2I$, then $B^{-1}$ is equal to

(A) $15I - B^3$ (B) $\frac{15I - B^3}{14}$
(C) $B^3 - 15I$ (D) $\frac{B^3 - 15I}{14}$

3. If $A = \begin{bmatrix} \frac{1}{3} & \frac{2}{3} & \frac{2}{3} \\ \frac{2}{3} & \frac{1}{3} & -\frac{2}{3} \\ \frac{x}{3} & \frac{2}{3} & \frac{y}{3} \end{bmatrix}$ is an orthogonal matrix then $|x + y|$ is

(A) 2 (B) 1
(C) Zero (D) 3

4. If the matrix $A = \begin{bmatrix} 2 & 0 & -1 \\ 5 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix}$ satisfies the equation $A^3 - 6A^2 + 11A - I = 0$, and if $A^{-1} = A^2 - kA + 11I$, then value of $k$ is

(A) 4 (B) 6
(C) –6 (D) 8

5. If $A$ is square matrix of order 3, then $\left|\frac{(A - A^T)^{2013}}{2013}\right|$ is equal to

(A) $\frac{1}{2013}$ (B) $\frac{1}{(2013)^{2013}}$
(C) $\frac{1}{(2013)^{2012}}$ (D) 0

6. If $\begin{vmatrix} x & 3 & x \\ x^2 & x & 2 \\ 5 & x^3 & x \end{vmatrix} = Ax^6 + Bx^5 + Cx^4 + Dx^3 + Ex^2 + Fx + G,$ then A + G=

(A) 32 (B) 31
(C) 24 (D) 25

7. If a + b + c = 0 then $\begin{vmatrix} 2bc - a^2 & c^2 & b^2 \\ c^2 & 2ac - b^2 & a^2 \\ b^2 & a^2 & 2ab - c^2 \end{vmatrix}$ is equal to

(A) 0 (B) $(a+b+c)^2 + 2abc$
(C) 1 (D) $a^3 + b^3 + c^3 - 3abc$

8. If $(I + A)^n + (1 - 2^n)A = I$ where $I$ is the unit matrix of same order as of $A$ then $A$ is

(A) Orthogonal matrix (B) Nilpotent matrix
(C) Idempotent matrix (D) Involutory matrix

9. If $A = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$ and $f(x) = \frac{x-1}{x+1}$ then $f(f(A))$ is

(A) $\begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$ (B) $\begin{bmatrix} 2 & -3 \\ -1 & 2 \end{bmatrix}$
(C) $\begin{bmatrix} -2 & 3 \\ 1 & -2 \end{bmatrix}$ (D) $\begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix}$

10. The system of homogeneous equations $tx + (t+1)y + (t-1)z = 0$, $(t+1)x + ty + (t+2)z = 0$, $(t-1)x + (t+2)y + tz = 0$ has a non-trivial solution for

(A) exactly three real values of t

(B) exactly two real values of t

(C) exactly one real value of t

(D) infinite number of values of t

11. If $A = [a_{ij}]$ is a square matrix of even order such that $a_{ij} = i^2 - j^2$, then

(A) A is skew-symmetric matrix

(B) A is a symmetric matrix and det A is a square

(C) A is a symmetric matrix and det A is zero

(D) None of these

12. Let $A = [a_{ij}]$ be a 3 x 3 matrix, where $a_{ij} = \lim_{x\to 0}\frac{(1+ix)^{\frac{1}{j}}-1}{x}$ for all $1 \le i, j \le 3$. Then $A^2$ equals

(A) 4A (B) 3A

(C) 2A (D) A

13. Let $A = \begin{bmatrix} \frac{\sqrt{3}}{2} & \frac{1}{2} \\ \frac{-1}{2} & \frac{\sqrt{3}}{2} \end{bmatrix}$, $B = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ and $C = ABA^T$,

then $A^TC^3A$ is equal to

(A) $\begin{bmatrix} \frac{\sqrt{3}}{2} & \frac{1}{2} \\ 1 & 0 \end{bmatrix}$ (B) $\begin{bmatrix} 1 & 0 \\ \frac{\sqrt{3}}{2} & 1 \end{bmatrix}$

(C) $\begin{bmatrix} 1 & \frac{\sqrt{3}}{2} \\ 0 & 3 \end{bmatrix}$ (D) $\begin{bmatrix} 1 & 3 \\ 0 & 1 \end{bmatrix}$

14. Let $g(x) = \begin{vmatrix} f(x+\alpha) & f(x+2\alpha) & f(x+3\alpha) \\ f(\alpha) & f(2\alpha) & f(3\alpha) \\ f'(\alpha) & f'(2\alpha) & f'(3\alpha) \end{vmatrix}$, where

$\alpha$ is a constant, then $\lim_{x\to 0}\frac{g(x)}{x}$ is equal to

(A) 0 (B) 1

(C) –1 (D) none of these

**SECTION - B**

**Multiple Correct Answer Type**

This section contains multiple choice questions. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONE OR MORE** is/are correct.

15. Equation of the plane perpendicular to the planes $x - y + z = 10$, $x - z = 100$ and passing through the point (1, 2, 3) is $ax + by + cz = 8$.

If $A = \begin{bmatrix} 1 & -1 & 1 \\ 1 & 0 & -1 \\ a & b & c \end{bmatrix}$, then

(A) $\det(A) = 6$

(B) $\det(\text{adj}(\text{adj } A)) = 6^4$

(C) $\det(\text{adj } A) = 9$

(D) $\sin^{-1}a + \sec^{-1}b + \cos^{-1}c = \frac{5\pi}{6}$

16. If the system of equations

$ax + y + 2z = 0$

$x + 2y + z = b$

$2x + y + az = 0$

has no solution then (a + b) can be equal to

(A) –1 (B) 2

(C) 3 (D) 4

17. Let $D(x) = \begin{vmatrix} x^2+4x-3 & 2x+4 & 13 \\ 2x^2+5x-9 & 4x+5 & 26 \\ 8x^2-6x+1 & 16x-6 & 104 \end{vmatrix} = \alpha x^3 + \beta x^2 + \gamma x + \delta$

then

(A) $\alpha + \beta = 0$ (B) $\beta + \gamma = 0$

(C) $\alpha + \beta + \gamma + \delta = 0$ (D) $\alpha + \beta + \gamma = 0$

18. If the system of equations

$(\sin\theta)x + (\sin 2\theta)y + (\sin 3\theta)z = 0$,

$(\sin\theta)x + (\cos\theta)y + (\sin\theta)z = 0$,

$(\cos\theta)x - (\sin\theta)y + (\cos\theta)z = 0$,

has non-zero solution, then $\theta$ can be equal to

(A) $\pi$ (B) $\frac{3\pi}{4}$

(C) $\frac{7\pi}{2}$ (D) $\frac{11\pi}{4}$

19. If $ax^3 + bx^2 + cx + d = \begin{vmatrix} x^2 & (x-1)^2 & (x-2)^2 \\ (x-1)^2 & (x-2)^2 & (x-3)^2 \\ (x-2)^2 & (x-3)^2 & (x-4)^2 \end{vmatrix}$,

then

(A) a = 0 (B) b = 0

(C) c = 0 (D) d = –8

20. Let $\Delta = \begin{vmatrix} x^2 & (y+z)^2 & yz \\ y^2 & (z+x)^2 & zx \\ z^2 & (x+y)^2 & xy \end{vmatrix}$ which of the following can be true ?

(A) $\Delta$ is divisible by $x^2 + y^2 + z^2$

(B) $\Delta = 0$

(C) $\Delta$ is divisible x + y + z

(D) $\Delta$ is divisible by both (x – y) and ( x + y + z)

21. If $A= (a_{ij})_{3x3}$ is a skew symmetric, then

(A) $a_{ii}= 0 \ \forall i$ (B) A + A′ is a null matrix

(C) $|A| = 0$ (D) A is not invertible.

**SECTION - C**

**Linked Comprehension Type**

This section contains paragraph. Based upon this paragraph, 2 multiple choice questions have to be answered. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** is correct.

**Paragraph for Question Nos. 22 to 23**

Let $A = \begin{bmatrix} a & 0 & 0 \\ 2a & a & 0 \\ 3a & 2a & a \end{bmatrix}$ and $X_1, X_2, X_3$ be three column matrices such that

$AX_1 = \begin{bmatrix} a \\ 0 \\ 0 \end{bmatrix}, AX_2 = \begin{bmatrix} 2a \\ 3a \\ 0 \end{bmatrix}$ and $AX_3 = \begin{bmatrix} 2a \\ 3a \\ a \end{bmatrix}$ and let $X$ be a 3 × 3 matrix

whose columns are $X_1, X_2, X_3$

22. Value of det $X$ is

(A) – 2 (B) – 1

(C) 3 (D) 0

23. Inverse of matrix $X$ is

(A) $\begin{bmatrix} -\frac{1}{3} & -\frac{2}{3} & 0 \\ -\frac{7}{3} & -\frac{5}{3} & -1 \\ 3 & 2 & 1 \end{bmatrix}$ (B) $\begin{bmatrix} -\frac{1}{3} & -\frac{2}{3} & 0 \\ -\frac{7}{3} & -\frac{5}{3} & 1 \\ 3 & 2 & 1 \end{bmatrix}$

(C) $\begin{bmatrix} -\frac{1}{3} & \frac{2}{3} & 0 \\ -\frac{7}{3} & -\frac{5}{3} & -1 \\ 3 & 2 & 1 \end{bmatrix}$ (D) $\begin{bmatrix} \frac{1}{3} & -\frac{2}{3} & 0 \\ -\frac{7}{3} & -\frac{5}{3} & -1 \\ 3 & 2 & 1 \end{bmatrix}$

**SECTION-D**

**Single-Match Type**

This section contains Single match questions. Each question contains statements given in two columns which have to be matched. The statements in **Column I** are labelled A, B, C and D, while the statements in **Column II** are labelled p,q,r,s. Four options A, B, C and D are given below. Out of which, only one shows the right matching

24. Suppose a,b,c are distinct and x,y,z are connected by the system of equations

$x + ay + a^2z = a^3$

$x + by + b^2z = b^3$

$x + cy + c^2z = c^3$

then

| **Column I** | **Column II** |
|---|---|
| (A) a + b + c | (p) x |
| (B) bc + ca + ab | (q) –y |
| (C) abc | (r) z |
| (D) (b+c) (c+a) (a+b) | (s) – (x + yz) |

| | **A** | **B** | **C** | **D** |
|---|---|---|---|---|
| (A) | r | q | p | s |
| (B) | p | s | q | r |
| (C) | s | r | q | p |
| (D) | p | q | r | s |

25. Match the following

| | Column I | | Column II |
|---|---|---|---|
| (A) | $a_{ij} = j^2 - i^2$ | (p) | Symmetric |
| (B) | $a_{ij} = i + j$ | (q) | Skew-symmetric |
| (C) | $a_{ij} = 0 \ \forall \ i > j$ | (r) | Lower triangular |
| (D) | $a_{ij} = 0 \ \forall \ i < j$ | (s) | Upper triangular |

| | A | B | C | D |
|---|---|---|---|---|
| (A) | r | s | q | p |
| (B) | p | s | q | r |
| (C) | s | r | q | p |
| (D) | q | p | s | r |

26. Match the following for the system of linear equations

$\lambda x + y + z = 1$

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

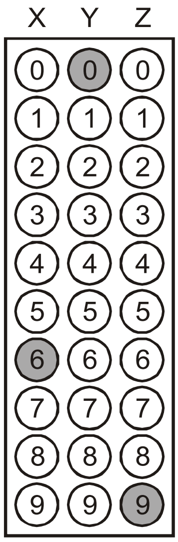
$x + y + \lambda z = \lambda^2$

| | Column - I | | Column - II |
|---|---|---|---|
| (A) | $\lambda = 1$ | (p) | unique solution |
| (B) | $\lambda \neq 1$ | (q) | infinite solution |
| (C) | $\lambda \neq 1, \lambda \neq -2$ | (r) | no solution |
| (D) | $\lambda = -2$ | (s) | May be consistent |

**SECTION-E**

**Integer Answer Type**

This section contains Integer type questions. The answer to each of the questions is a single digit integer, ranging from 0 to 9. The appropriate bubbles below the respective question numbers in the ORS have to be darkened. For example, if the correct answers to question numbers X, Y and Z(say) are 6, 0 and 9, respectively, then the correct darkening of bubbles will look like the following :




27. If A is a square matrix of order n such that |adj (adj A)| = $|A|^9$, then the value of n can be

28. $\frac{1}{x} + \frac{2}{y} + \frac{1}{z} = 2,$

$\frac{3}{x} - \frac{4}{y} - \frac{2}{z} = 1,$

$\frac{2}{x} + \frac{5}{y} - \frac{2}{z} = 3,$

then the value of z is ______

solve the system for z by Cramer's rule

29. If $\Delta(x) = \begin{vmatrix} e^x & \sin 2x & \tan x^2 \\ \ln(1+x) & \cos x & \sin x \\ \cos x^2 & e^x - 1 & \sin x^2 \end{vmatrix} = A + Bx + Cx^2$ +............ then B is equal to

30. If $\alpha, \beta, \gamma$ are the roots of $x^3 + ax^2 + b = 0$, then the determinant $\Delta = \begin{vmatrix} \alpha & \beta & \gamma \\ \beta & \gamma & \alpha \\ \gamma & \alpha & \beta \end{vmatrix}$ equals $a^\lambda$, then $\lambda$ =

❑ ❑ ❑

## SECTION - A
### Straight Objective Type

This section contains multiple choice questions. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** is correct.

1. Let $P = \begin{bmatrix} \cos\frac{\pi}{9} & \sin\frac{\pi}{9} \\ -\sin\frac{\pi}{9} & \cos\frac{\pi}{9} \end{bmatrix}$ then the value of $|P^9 + P^{18}|$ is

(A) 1 (B) 2

(C) 3 (D) 0

2. a $\in$ R; $M_{n\times n}$ is non zero; $M^2 = M$, if $(I - aM)^{-1} = I - 3M$; 2a =

(A) 1 (B) 2

(C) 3 (D) 4

3. Let $P$ and $Q$ be two different matrices satisfying $P^3 = Q^3$ and $P^2Q = Q^2P$, then

(A) det($P^2 + Q^2$) must be zero

(B) det($P - Q$) must be zero

(C) det($P^2 + Q^2$) as well as det($P - Q$) must be zero

(D) At least one of det($P^2 + Q^2$) or det($P - Q$) must be zero

4. $A$ is a square matrix of order 3 × 3 and $I$ is a unit matrix of order 3 × 3. If $|A| = 2$ and $AA' = I$ then the determinant value of the matrix $(A - I)$ is equal to

(A) 1 (B) 2

(C) 0 (D) 3

5. $A$ is a $n \times n$ matrix whose elements are all '1' and $B$ is a $n \times n$ matrix whose diagonal elements are all '$n$' and other elements are '$n - r$' then $(B - rI)[B - (n^2 - nr + r)I]$ is

(A) $I$ (B) $-I$

(C) Null matrix (D) $A$

6. If A and P are different matrices of order n satisfying $A^3 = P^3$ and $P^2A = PA^2$ (where $|A| \neq |P|$) then $|A^2 + P^2|$ is equal to

(A) n (B) 0

(C) |A| |P| (D) |A + P|

7. Let matrix $A = \begin{bmatrix} x & y & -z \\ 1 & 2 & 3 \\ 1 & 1 & 2 \end{bmatrix}$, where x, y, z $\in$ N. If $|\text{adj}(\text{adj}(\text{adj}(\text{adj}A)))| = 4^8.5^{16}$, then the number of such matrix is

(A) 28 (B) 36

(C) 45 (D) 55

8. Matrices of order 3x3 are formed by using the elements of the set A = {-3,-2,-1,0,1,2,3} then probability that matrix is either symmetric or skew symmetric is

(A) $\frac{1}{7^6} + \frac{1}{7^3}$

(B) $\frac{1}{7^9} + \frac{1}{7^3} - \frac{1}{7^6}$

(C) $\frac{1}{7^3} + \frac{1}{7^9}$

(D) $\frac{1}{7^3} + \frac{1}{7^6} - \frac{1}{7^9}$

9. Let $C_k = {}^nC_k$ for $0 \le k \le n$ and $A_k = \begin{bmatrix} C_{k-1}^2 & 0 \\ 0 & C_k^2 \end{bmatrix}$ for $k \ge 1$ and $A_1 + A_2 + .... + A_n = \begin{bmatrix} k_1 & 0 \\ 0 & k_2 \end{bmatrix}$, then

(A) $k_1 = k_2$ (B) $k_1 + k_2 = {}^{2n}C_{2n} + 1$

(C) $k_1 = {}^{2n}C_{2n} - 1$ (D) $k_2 = {}^{2n}C_{n+1}$

## SECTION - B

**Multiple Correct Answer Type**

This section contains multiple choice questions. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONE OR MORE** is/are correct.

10. If $A = \begin{bmatrix} 3 & 1 \\ -4 & -1 \end{bmatrix}$ then

(A) $A^2 = \begin{bmatrix} 5 & 2 \\ -8 & -3 \end{bmatrix}$ (B) $A^3 = \begin{bmatrix} 7 & 3 \\ -12 & -5 \end{bmatrix}$

(C) $A^{16} = \begin{bmatrix} 33 & 16 \\ -64 & -31 \end{bmatrix}$ (D) $A^6 = \begin{bmatrix} 12 & 6 \\ -24 & -12 \end{bmatrix}$

11. If $M = \begin{bmatrix} \sin\theta & \cos\theta \\ -\cos\theta & \sin\theta \end{bmatrix}$, $A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ and $N = MAM^T$, then

(A) $M^TN^2M = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$

(B) $M^TN^{100}M = \begin{bmatrix} 1 & 100 \\ 0 & 1 \end{bmatrix}$

(C) $MM^T = I$

(D) $M^TN^{99}M = \begin{bmatrix} 1 & 99 \\ 1 & 1 \end{bmatrix}$

12. If A and B are square matrix of order 3 and AB = B and BA = A, then

(A) $A^2-B^2=0$ (B) $A^2+B^2=A+B$

(C) $(A-B)^2=0$ (D) $(A+B)^2=A+B$

13. The maximum and minimum value of a third order determinant whose elements belong to the set {–3, –2, –1, 0, 1, 2, 3} can be

(A) 108 (B) 81

(C) – 81 (D) – 108

14. Let $A$ be a matrix of order 3 × 3 and matrices $B$, $C$, $D$ are related such that $B$ = adj. ($A$), $C$ = adj. (adj.$A$), $D = (\text{adj}(\text{adj}(\text{adj } A)))$

if $\left|(\text{adj}(\text{adj}(\text{adj}(\text{adj } ABCD))))\right|$ is $|A|^k$, then $k$

(A) Is less than 256 (B) Has 20 divisors

(C) Is a perfect square (D) Is an even number

15. In a set A = {$3^3$, $7^3$, $11^3$, $15^3$, ....} if 9 elements are selected from set A and a matrix B of order 3×3 is made then, Det(B) must be divisible by

(A) 2 (B) 4

(C) 8 (D) 16

16. If A and B are 3 x 3 matrices and $|A| \neq 0$, then

(A) $|AB| = 0 \Rightarrow |B| = 0$

(B) AB = 0 $\Rightarrow$ B is always null matrix

(C) $|A^{-1}| = |A|^{-1}$

(D) $|2A| = 2|A|$

17. If $A = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}$, then

(A) $A^3 - A^2 = A - I$ (B) $\text{Det}(A^{2010} - I) = 0$

(C) $A^{50} = \begin{bmatrix} 1 & 0 & 0 \\ 25 & 1 & 0 \\ 25 & 0 & 1 \end{bmatrix}$ (D) $A^{50} = \begin{bmatrix} 1 & 1 & 0 \\ 25 & 1 & 0 \\ 25 & 0 & 1 \end{bmatrix}$

## SECTION - C

**Linked Comprehension Type**

This section contains paragraph. Based upon this paragraph, 2 multiple choice questions have to be answered. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** is correct.

**Paragraph for Question Nos. 18 and 19**

Consider the determinant

$$\Delta = \begin{vmatrix} p & q & r \\ x & y & z \\ l & m & n \end{vmatrix}$$

$M_{ij}$ denotes the minor of an element in $i^{th}$ row and $j^{th}$ column and $C_{ij}$ denotes the cofactor of an element in $i^{th}$ row and $j^{th}$ column.

18. The value of $p \cdot C_{21} + q \cdot C_{22} + r \cdot C_{23}$ is

(A) 0 (B) $-\Delta$

(C) $\Delta$ (D) $\Delta^2$

19. The value of $x \cdot C_{21} + y \cdot C_{22} + z \cdot C_{23}$ is

(A) 0 (B) $-\Delta$

(C) $\Delta$ (D) $\Delta^2$

**Paragraph for Q.Nos. 20 to 22**

Let $A = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 3 & 2 & 1 \end{bmatrix}$ and $U_1, U_2, U_3$ are columns of a 3 × 3 matrix of U. If column matrices $U_1, U_2, U_3$ satisfy

$$AU_1 = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, AU_2 = \begin{bmatrix} 2 \\ 3 \\ 0 \end{bmatrix}, AU_3 = \begin{bmatrix} 2 \\ 3 \\ 1 \end{bmatrix}$$

20. The value of $|U|$ is

(A) 3 (B) $-3$

(C) 3/2 (D) 2

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

(A) $-1$ (B) 0

(C) 1 (D) 3

22. The value of $[3 \quad 2 \quad 0]\ U \begin{bmatrix} 3 \\ 2 \\ 0 \end{bmatrix}$ is

(A) 5 (B) 5/2

(C) 4 (D) 3/2

**SECTION-D**

**Single-Match Type**

This section contains Single match questions. Each question contains statements given in two columns which have to be matched. The statements in **Column I** are labelled A, B, C and D, while the statements in **Column II** are labelled p,q,r,s. Four options A,B,C and D are given below. Out of which, only one shows the right matching

23. Consider the matrix $A = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} a & 6 \\ 0 & 1 \end{bmatrix}$

Let P be any orthogonal matrix, $Q = PAP^T$,

$R = P^TQ^KP$, $S = PBP^T$ and $T = P^TS^KP$.

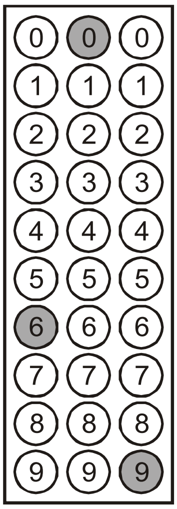
| Column - I | Column - II |
| --- | --- |
| (A) If we vary K from 1 to 'n' then the elements at first row first column of R will form | (p) G.P. with common ratio a |
| (B) If we vary k from 1 to n, then the elements at second row second column of R will form | (q) A.P. with common difference 2 |
| (C) If we vary k from 1 to n, then the elements at first row first column of T will form | (r) G.P. with common ratio '6' |
| (D) If we vary k from 3 to n, then the elements at first row second column of T will represent the sum of | (s) A.P. with common difference – 2 |

## SECTION-E

### Integer Answer Type

This section contains Integer type questions. The answer to each of the questions is a single digit integer, ranging from 0 to 9. The appropriate bubbles below the respective question numbers in the ORS have to be darkened. For example, if the correct answers to question numbers X, Y and Z(say) are 6, 0 and 9, respectively, then the correct darkening of bubbles will look like the following :

X Y Z



24. If $\begin{vmatrix} b_2c_3 - b_3c_2 & a_3c_2 - a_2c_3 & a_2b_3 - a_3b_2 \\ b_3c_1 - b_1c_3 & a_1c_3 - a_3c_1 & a_3b_1 - a_1b_3 \\ b_1c_2 - b_2c_1 & a_2c_1 - a_1c_2 & a_1b_2 - a_2b_1 \end{vmatrix} = 49$ and

$\begin{vmatrix} a_1 & b_1 & c_1 \\ a_3 & b_3 & c_3 \\ a_2 & b_2 & c_2 \end{vmatrix} = k$, then the value of |k| is________

25. Let $\begin{vmatrix} x & 2 & x \\ x^2 & x & 1 \\ x & x & 2 \end{vmatrix} = Ax^4 + Bx^3 + Cx^2 + Dx + E$ and

7A + 5B + 3C + D – E=–K, then K= ________

26. Let $A = \begin{bmatrix} 2 & 1 \\ 4 & 1 \end{bmatrix}, B = \begin{bmatrix} 3 & 4 \\ 2 & 3 \end{bmatrix}$ and $C = \begin{bmatrix} 3 & -4 \\ -2 & 3 \end{bmatrix}$ be three given matrices and tr(A) denotes the trace of the matrix *A*, then $\text{tr}(A) + \text{tr}\left(\frac{1}{2}(ABC)\right) + \text{tr}\left(\frac{1}{4}A(BC)^2\right) + \text{tr}\left(\frac{1}{8}(A(BC)^3)\right) + \ldots..$ to infinitely many terms is equal to _____.

27. The set of natural numbers *M* partitioned into arrays of rows and columns in the form of matrices as $M_1 = [1],\ M_2 = \begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}$,

$M_3 = \begin{bmatrix} 6 & 7 & 8 \\ 9 & 10 & 11 \\ 12 & 13 & 14 \end{bmatrix}, \ldots\ldots.., M_n = [\ ]_{n \times n}$

and so on, where the sum of the elements of the principal diagonal in $M_6$ is (440 + λ) , then λ is _____.

28. Let A and B be two non-singular square matrices such that $B \neq^{1} I$ and $AB^2 = BA$. If $A^3 = B^{-1}A^3B^n$, then value of n is _______.

29. If a,b,c, are the roots of $x^3 + 2x^2 + p = 0$, then the value of $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$ is

30. If $|a_2 - a_3| = 6$, the maximum value of

$f(x) = \begin{vmatrix} 2 & a_3 & a_2 \\ 2 & a_3 & 2a_2 - x \\ 2 & 2a_3 - x & a_2 \end{vmatrix}$ is λ, then $\frac{\lambda}{6}$

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# ANSWERS

## LEVEL-1

| | | | | | |
|---|---|---|---|---|---|
| 1. (C) | 2. (B) | 3. (D) | 4. (B) | 5. (D) | 6. (B) |
| 7. (A) | 8. (C) | 9. (C) | 10. (C) | 11. (A) | 12. (B) |
| 13. (D) | 14. (A) | 15. (A, B, D) | 16. (B, C, D) | 17. (A, B, D) | 18. (A, B, D) |
| 19. (A, B, C, D) | 20. (A, C, D) | 21. (A, B, C, D) | 22. (C) | 23. (A) | 24. (A) |
| 25. (D) | 26. (A-q,s B-p,s,r C-p,s D-r) | | 27. (4) | 28. (3) | 29. (0) |
| 30. (3) | | | | | |

## LEVEL-2

| | | | | | |
|---|---|---|---|---|---|
| 1. (D) | 2. (C) | 3. (D) | 4.(C) | 5. (C) | 6. (B) |
| 7. (B) | 8. (D) | 9. (A) | 10. (A, B, C) | 11. (A, B, C) | 12. (B, C) |
| 13. (A, D) | 14. (A, B, D) | 15. (A, B, C, D) | 16. (A, B, C) | 17. (A, B, C) | 18. (A) |
| 19. (C) | 20. (A) | 21. (B) | 22. (A) | 23. (A-q B-s C-p D-p) | |
| 24. (7) | 25. (5) | 26. (6) | 27. (1) | 28. (8) | |
| 29. (8) | 30. (3) | | | | |

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