NEW STANDARD ACADEMY

Marks: 80

Date : 24-11-25 | CLASS : 12TH MATH'S | Time: 3 hours

SECTION-A

1. Total number of possible matrices of order 3×3 with each entry 2 or 0 is
   (a) 27 (b) 9
   (c) 81 (d) 512
2. If 4 is a 3× 3 matrix, B is a 2 × 3 matrix and matrix, then the number of elements in A, B and C. = 2 × 1 respectively are:
   (a) 6,2,9 (b) 9,2,6
   (c) 3,2,1 (d) 9,6,2
3. If A and B are two matrices of the order 3×m and 3×n respectively and m = n, then order of matrix (54-2B) is
   (a) m × 3 (b) 3 × 3
   (c) m×n (d) 3×n
4. If A $=\begin{bmatrix} i & 0 \\ 0 & i \end{bmatrix}$ n ϵ N then A^6 equals
   (a) $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 0 & i \\ i & 0 \end{bmatrix}$
   (c) $\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$ (d) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$
5. If A is a matrix of order 2 × 3 and B is a matrix such that AB and AB' are both defined, then the order of matrix B is:
   (a) 2 × 2 (b) 2 × 1
   (c) 3 × 2 (d) 3 ×3
6. The matrix $\begin{bmatrix} 0 & -5 & 8 \\ 5 & 0 & 12 \\ -8 & -12 & 0 \end{bmatrix}$ is a
   (a) symmetric matrix
   (b) scalar matrix
   (c) diagonal matrix
   (d) skew-symmetric matrix
7. If A and B are two square matrices such that AB = I then which of the following is not true?
   (a) BA = I (b) $B^{-1} = A$
   (c) $A^{-1} = B$ (d) $A^2 = B$
8. If $\begin{vmatrix} \alpha & 3 & 4 \\ 1 & 2 & 1 \\ 1 & 4 & 1 \end{vmatrix} = 0$ then the value of α is
   (a) 1 (b) 2
   (c) 3 (d) 4
9. If $\begin{vmatrix} 1 & 2 & 2 \\ 2 & 3 & 1 \\ 3 & \alpha & 1 \end{vmatrix}$ is non –singular matrix and $\alpha \epsilon a$ then the set A is
   (a) R (b) {0}
   (c){4} (d) R-{4}
10. Minor of an element of a determinant of order n(n ≥ 2) is a determinant of order
    (a) n (b) n – 1
    (c) n – 2 (d) n + 1
11. If C_{ij} denotes the cofactor of element P_{ij} of the matrix P = $\begin{bmatrix} 1 & -1 & 1 \\ 0 & 2 & -3 \\ 3 & 2 & 4 \end{bmatrix}$ then the value of $C_{31}.C_{23}$ is
    (a) 5 (b) 24
    (c)-24 (d) -5
12. If $\Delta= \begin{vmatrix} 1 & a & bc \\ 1 & b & ca \\ 1 & c & ab \end{vmatrix}$ =| matrix 1&a&bc\\ 1&b&ca\\ 1&c& ab matrix | then the minor M_{31} is
    (a) - c $(a^2 - b^2)$ (b) $c(b^2 - a^2)$
    (c) $c(a^2 + b^2)$ (d) $c(a^2 - b^2)$
13. If $\Delta= \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$ and A_{ij} is cofactors of then the value of A is given by a ij
    (a) $a_{11}A_{11}+ a_{12}A_{21} + a_{13}A_{31}$
    (b) $a_{11}A_{31} + a_{12}A_{32} + a_{13}A_{33}$
    (c) $a_{21}A_{11} + a_{22}A_{12} + a_{23}A_{13}$
    (d) $a_{11}A_{11}+ a_{21}A_{21} + a_{31}A_{31}$
14. If A is a square matrix of order 3 and |A| = - 5 then |adj A| is
    (a) 125 (b) -25
    (c) 25 (d) ±25
15. If A is a square matrix of order 3, such that A(adj A) = 10I , then |adj A| is equal to
    (a) 1 (b) 10
    (c) 100 (d) 101
16. If A and B are invertible square matrices of the same order, then which of the following is not correct?

(a) $|AB^{-1}| = \frac{|A|}{|B|}$ (b) $|(AB)^{-1}| = \frac{1}{|A||B|}$
(c) $(AB)^{-1} = B^{-1} + A^{-1}$
(d) $(A + B)^{-1} = B^{-1} + A^{-1}$

17. Given that A is a square matrix of order 3 and $|A| = -2$ then $|adj(2A)|$ is equal to
(a) -2^6 (b) $+4$
(c) -2^8 (d) 2^8

18. If A is a matrix of order 3 and $|A| = 2$ then adj Al is equal to
(a) 1 (b) 2
(c) 2^3 (d) 2^2

Assertion and Reason

Direction: In the following questions, A statement of Assertion (A) is followed by a statement of Reason (R). Mark the correct choice as.
(a) Both Assertion (A) and Reason (R) are true, and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true, but Reason (R) is false.
(d) Assertion (A) is false, but Reason (R) is true.

19. **Assertion (A):** Minor of an element of a determinant of order $n(n \geq 2)$ is a determinant of order n
Reason (R): If A is an invertible matrix of order 2, then det (A^{-1}) is equal to $\frac{1}{|A|}$.

20. **Assertion (A):** The matrix A = $\begin{bmatrix} 3 & -1 & 0 \\ \frac{3}{2} & 3\sqrt{2} & 1 \\ 4 & 3 & -1 \end{bmatrix}$ is rectangular matrix of order 3.
Reason (R): If $A=[a_{ij}]_{m\times 1}$, then A is column matrix.

SECTION-B

21. Construct a 2×2 matrix, $A=[a_{ij}]$ whose elements are given by $a_{ij} = \frac{(i+j)^2}{2}$

22. If matrix A = $\begin{bmatrix} 2 & 3 \\ 1 & 0 \\ 3 & 4 \end{bmatrix}$ and matrix B= $\begin{bmatrix} 1 & 5 \\ 3 & 2 \\ 0 & -1 \end{bmatrix}$ then find AB'

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

24. For the matrices A = $\begin{bmatrix} 2 & 1 \\ 5 & 3 \end{bmatrix}$ and B $=\begin{bmatrix} 4 & 5 \\ 3 & 4 \end{bmatrix}$ verify that $(AB)^{-1}$ $B^{-1}A^{-1}$

25. Find minors and cofactors of the elements a_{11}, a_{21} in the determinant
$\Delta= \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$

SECTION-C

26. If A $=\begin{bmatrix} 1 & 5 \\ 7 & 12 \end{bmatrix}$ *and B* $\begin{bmatrix} 9 & 1 \\ 7 & 8 \end{bmatrix}$ then find a matrix C such that 3A+5B +2C is null matrix.

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

28. Find the maximum value of $\Delta=$ $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+sin\theta & 1 \\ 1+cos\theta & 1 & 1 \end{vmatrix}$ (where θ is real number)

29. If A = $\begin{bmatrix} 1 & tanx \\ -\tan x & 1 \end{bmatrix}$ then show that $A^T A^{-1} = \begin{bmatrix} \cos 2x & -sin2x \\ sin2x & cos2x \end{bmatrix}$

30. Using Cofactors of elements of third column, evaluate
$\Delta= \begin{vmatrix} 1 & x & yz \\ 1 & y & zx \\ 1 & z & xy \end{vmatrix}$

31. Find the minors of the diagonal elements of the determinant $\begin{vmatrix} 1 & i & -i \\ -i & 1 & i \\ 1 & -i & i \end{vmatrix}$.

SECTION- D

32. If X $=\begin{bmatrix} 3 & 1 & -1 \\ 5 & -2 & -3 \end{bmatrix}$ *and* $Y =$ $\begin{bmatrix} 2 & 1 & -1 \\ 7 & 2 & 4 \end{bmatrix}$ then find (i) X+ Y (ii) 2X-3Y

33. Show that ΔABC *is an isosceles* triangle if the determinant
$\Delta \begin{vmatrix} 1 & 1 & 1 \\ 1+cosA & 1+cosB & 1+co \\ cos^2A+\cos A & cos^2B+cosB & Cos^2C+ \end{vmatrix}$
0

34. If A = $\begin{bmatrix} \cos\alpha & -sin\alpha & 0 \\ sin\alpha & cos\alpha & 0 \\ 0 & 0 & 1 \end{bmatrix}$, find adj A and verify that A(adjA)= (adjA)A= $|A|I_3$

35. Find minors and cofactors of the elements

of the determinant $\begin{vmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & -7 \end{vmatrix}$ and verify that $a_{11}A_{31} + a_{12}A_{32} + a_{13}A_{33} = 0$

SECTION-E

36. Case Based-1

Gautam buys 5 pens, 3 bags and I instrument box and pays a sum of ₹160. From the same shop, Vikram buys 2 pens, 1 bag and 3 instrument boxes and pays a sum of ₹190. Also Ankur buys I pen, 2 bags and 4 instrument boxes and pays a sum of ₹250.

Based on the above information, answer the following questions:

(i) Convert the given above situation into a matrix equation of the form AX = B.

(ii) Find |A|,

(iii) Find A^{-1}

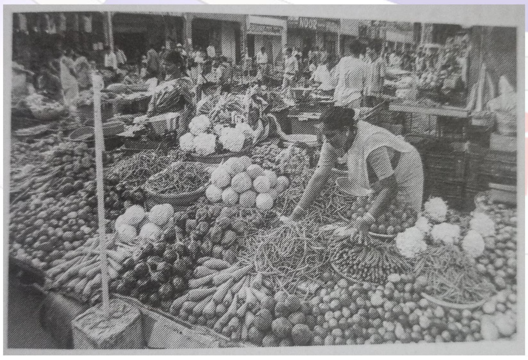
OR

Determine $P = A^2 - 5A$.

	Pen	Bags	Instrument
Gautam	5	3	1
Vikram	2	1	3
Ankur	1	2	4

37. Case Based-II

Three friends Rahul, Ravi and Rakesh went to a vegetable market to purchase vegetable. From a vegetable shop Rahul purchased 1 kg of each Potato, Onion and Brinjal for a total of ₹21. Ravi purchased 4 kg of potato, 3 kg of onion and 2 kg of Brinjal for 60 while Rakesh purchased 6 kg potato, 2 kg onion and 3 kg brinjal for ₹70.



(i) If the cost of potato, onion and brinjal, are x, 2y and z per kg respectively, then convert above situation into system of linear equations.

(ii) Convert the above system of linear equations in (1) in the form of AX B.

(iii) Find A^{-1}.

OR

Find the cost of potato, onion and brinjal.

38. Case Based-III

Amit, Biraj and Chirag were given the task of creating a square matrix of order 2. Below are the matrices created by them. A, B, Care the matrices created by Amit, Biraj and Chirag respectively.

$A = \begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix}, B = \begin{bmatrix} 4 & 0 \\ 1 & 5 \end{bmatrix}, C = \begin{bmatrix} 2 & 0 \\ 1 & -2 \end{bmatrix}$

Based on the above information, answer the following questions.

(1) Find the sum of the matrices A, B and C, A + (B + C)

(ii) Evaluate $(A^T)^T$,

(iii) Find the matrix AC - BC

OR

Find the matrix of (a + b) B when a = 4 and b = - 2