B.K. BIRLA CENTRE FOR EDUCATION

SARALA BIRLA GROUP OF SCHOOLS
A CBSE DAY-CUM-BOYS' RESIDENTIAL SCHOOL

MID-APRIL TEST 2025-26
MATHEMATICS

Class: XII | **Time: 1hr**
Date: 16.04.25 | **Marking Key** | **Max Marks: 25**
Admission no: | **Roll no:**

General Instructions:
Question 1 to 5 carries ONE mark each. Questions 6 to 8 carries TWO marks each. Questions 09 to 11 carries THREE marks each. Question 12 carry 5 mark. All questions are compulsory.

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1. If $\begin{vmatrix} 5 & 3 & -1 \\ -7 & x & -3 \\ 9 & 6 & -2 \end{vmatrix}$ =0, Then the value of x is
   a) 3   b)5   c) 7   **d) 9**
2. Matrix A = $\begin{bmatrix} 0 & 2b & -2 \\ 3 & 1 & 3 \\ 3a & 3 & -1 \end{bmatrix}$ is given to be symmetric. Find the values of a &b.
   a) **a= -2/3, b= 3/2**   b) a=3/2, b= -3/2   c) a=2/3, b= -2/3   d) None of these
3. If A is a square matrix such that A^2= A, then $(I-A)^3$ +A is equal to
   a) **I**   b) 0   c) I-A   d) I+A
4. The value of $\begin{vmatrix} cos15° & sin15° \\ sin75° & cos75° \end{vmatrix}$ is
   a) 1   **b)0**   c) -1   d) None of these
5. If the points (2,-3) , (x,-1) and (0,4) are collinear, then the value of x is
   a) **10/7**   b) 7/3   c) 13/7   d) 16
6. For a 2x3 matrix, A= $[a_{ij}]$, whose elements are given by $a_{ij} = \frac{(i+2j)^2}{4}$, Write the value of a_{13} x a_{23}.

Sol: $a_{13}= \frac{49}{4}$, a_{23} = 16 , a_{13} xa_{23} = 49x4 = 196.

7. If $\begin{bmatrix} x-y & 2y \\ 2y+z & x+y \end{bmatrix} = \begin{bmatrix} 1 & 4 \\ 9 & 5 \end{bmatrix}$, then write the value of x+y+z.

Sol: On comparing x=3, y= 2 and z= 5, x+y+z = 10.

8. Find k, if the points (3,-2), (k, 2), (8, 8) are collinear.

Sol: $\begin{vmatrix} 3 & -2 & 1 \\ k & 2 & 1 \\ 8 & 8 & 1 \end{vmatrix}$ =0, on solving, k= 5.

9. If A = $\begin{bmatrix} 3 & 1 \\ 7 & 5 \end{bmatrix}$, find x and y such that A^2+xI=yA.

Sol: $\begin{bmatrix}16 & 8\\56 & 32\end{bmatrix}$ +x$\begin{bmatrix}1 & 0\\0 & 1\end{bmatrix}$ = y $\begin{bmatrix}3 & 1\\7 & 5\end{bmatrix}$

On solving: y=8, x= 24-16=8

10. Find the inverse of the matrix A= $\begin{bmatrix}1 & 2 & 3\\2 & 3 & 1\\3 & 1 & 2\end{bmatrix}$ and verify that A^{-1} A = I.

Sol: A^{-1}= $\frac{1}{|A|}$ adjA = -$\frac{1}{18}\begin{bmatrix}5 & -1 & -7\\-1 & -7 & 5\\-7 & 5 & -1\end{bmatrix}$ = $\begin{bmatrix}-5/18 & 1/18 & 7/18\\1/18 & 7/18 & -5/18\\7/18 & -5/18 & 1/18\end{bmatrix}$ =

A^{-1} A = $\begin{bmatrix}-5/18 & 1/18 & 7/18\\1/18 & 7/18 & -5/18\\7/18 & -5/18 & 1/18\end{bmatrix}\begin{bmatrix}1 & 2 & 3\\2 & 3 & 1\\3 & 1 & 2\end{bmatrix}$ =I

11. If A = $\begin{bmatrix}2 & -1\\-1 & 2\end{bmatrix}$ and I is the identity matrix of order 2, then show that A^2 = 4A-3I. Hence find the A^{-1}.

Sol: A^2 =$\begin{bmatrix}5 & -4\\-4 & 5\end{bmatrix}$, 4A = $\begin{bmatrix}8 & -4\\-4 & 8\end{bmatrix}$, 3I = $\begin{bmatrix}1 & 0\\0 & 1\end{bmatrix}$

A^2 = 4A-3I

A^2+3I = 4A, multiply both side by A^{-1} we have A+3A^{-1} = 4I

A^{-1}= (4I –A)/3

12. Using the matrix method, solve the following system of equations: x+2y+z=7, x+3z=11, 2x-3y=1.

Sol: A = $\begin{bmatrix}1 & 2 & 1\\1 & 0 & 3\\2 & -3 & 0\end{bmatrix}$, $|A|$= 18

adjA = $\begin{bmatrix}9 & 6 & -3\\-3 & -2 & 7\\6 & -2 & -2\end{bmatrix}$, A^{-1} = $\frac{1}{|A|}$ adjA = $\frac{1}{18}\begin{bmatrix}9 & 6 & -3\\-3 & -2 & 7\\6 & -2 & -2\end{bmatrix}$

X= A^{-1}B = $\frac{1}{18}\begin{bmatrix}9 & 6 & -3\\-3 & -2 & 7\\6 & -2 & -2\end{bmatrix}\begin{bmatrix}7\\11\\1\end{bmatrix}$

X = $\begin{bmatrix}2\\1\\3\end{bmatrix}$, x= 2, y=1 , z= 3

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